

PROCEDURE MANUAL
for
PROFESSIONAL SERVICES



***STATE OF MARYLAND
DEPARTMENT OF GENERAL SERVICES***

Boyd K. Rutherford, Secretary

OFFICE OF FACILITIES PLANNING, DESIGN AND CONSTRUCTION

PROJECT MANAGEMENT AND DESIGN DIVISION

***State Office Building
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July, 2003

FOREWORD

This Procedure Manual is incorporated by reference and made a part of the Standard Form of Agreement with Architects and Engineers. In the event of any conflict between the provisions of this manual and the provisions of the Architect/Engineer agreement, the provisions of the Architect/Engineer agreement shall govern.

This Manual has been prepared to serve as a guide for providing professional services during all phases of design and the preparation of contract documents for the construction, alteration or renovation of State buildings. It is intended that the procedures outlined herein shall be followed to the fullest extent practicable for other State public improvements such as special structures, roads, utilities, site improvements, etc.

It is further intended to include all professional services. The term "Architect/Engineer" (A/E) includes architects, engineers, landscape architects, and other qualified professionals who may furnish such services in the development of State public improvements.

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CHAPTER I

TITLE: GENERAL	Revised: July 2003
Responsible Organization: Office of Facilities Planning (OFP)	
Instructions: This procedure supersedes the DGS Procedure Manual for Professional Services, dated July 1998. Please recycle the superseded document.	

1 PROCEDURES FOR PROCUREMENT OF PROFESSIONAL SERVICES

1.1 THE FOLLOWING PROCEDURES GOVERN THE SELECTION OF ARCHITECTS AND ENGINEERS (A/E) to provide professional services for both individual projects and Indefinite Quantity Contracts in the fee range as noted. The following procedures are in accordance with The State Finance and Procurement Article, Title 13, Subtitle 3, Annotated Code of Maryland, and State Procurement Regulations, Title 21, Subtitle 12, Chapters 04 and 05, Code of Maryland Regulations (COMAR).

1.2 TOTAL FEES IN EXCESS OF \$200,000: Expressions of interest in projects within this fee category will be solicited through announcements in the Maryland Contract Weekly and other appropriate publications. Respondent firms will subsequently be asked to submit their qualifications to the General Professional Services Selection Board (GPSSB) for evaluation by the Qualification Committee. Firms whose qualifications are rated 85% or better of the maximum attainable score are qualified for the project. The Qualification Committee will present the ranking of the firms to the GPSSB for approval. Once approved, the Negotiation Committee will initiate negotiations with the most qualified (highest ranked) of those firms. The Negotiation Committee will attempt to negotiate a fair, competitive and reasonable fee with the most qualified firm. If successful, the Negotiation Committee will present the final fee to the GPSSB for approval and subsequent recommendation to the Board of Public Works (BPW). If unsuccessful, the Negotiation Committee will terminate negotiations with the top ranked firm and initiate negotiation with the next most qualified firm. (Title 21, Subtitle 12, Chapter 04, COMAR).

NOTE: The A/E's proposal shall include a fee for all phases of work defined in the Request for Proposal (RFP). However, the initial contract may include only phases for which funds have been appropriated. DGS may add the additional phases to the A/E contract as funds are appropriated.

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1.3 TOTAL FEES TO \$200,000: Expressions of interest in projects within this fee range are solicited through announcements in the Maryland Contract Weekly. Interested firms will be asked to submit a letter of interest and/or a brief statement of qualifications to The Department of General Services (DGS) for consideration. DGS and the Using Agency (UA) will form an Evaluation Committee to evaluate the qualifications and rank the firms. Firms whose qualifications are rated 85% or better of the maximum attainable score are qualified to proceed to the fee negotiation phase. The Negotiation Committee will initiate negotiations with the most qualified of those firms. The Committee will attempt to negotiate a fair and reasonable fee with the most qualified firm. If successful, the Committee will present the final fee to the DGS Procurement and Review Board (DPRB) for approval. If unsuccessful, the Committee will terminate negotiations with the top rated firm and initiate negotiations with the next most qualified firm. (Title 21, Subtitle 12, Chapter 05, COMAR).

1.3 INDEFINITE QUANTITY CONTRACT (IQC): DGS will periodically enter into an IQC with one or more firms to provide architectural and engineering services to design small construction projects, perform studies (including value engineering), review documents, or write programs.

A. Individual Assignments on an IQC will be awarded successively to ranked firms if DGS is satisfied

- (1) with the services provided by the firm.
- (2) that the firm has sufficient personnel and resources to undertake additional work.
- (3) that the fee for the services proposed is fair, competitive, and reasonable.
- (4) that another ranked firm does not have special qualifications or experience that would positively and significantly affect performance on a particular project.

1.4 CHANGES TO THE A/E DESIGN TEAM

A. Once Approved By The GPSSB, changes are not permitted on a design team unless written authorization is granted by the DGS Administrator for A/E Procurement.

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B. If It Becomes Necessary for a prime firm to release a consultant firm on an approved design team, a written request and justification shall be provided to the Administrator.

- (1) Information about the qualifications and experience of the proposed substitute firm shall be included in the written request to the Administrator.
- (2) The Administrator will reconvene the Qualification Committee from the original A/E Procurement to review the information submitted for the substitute firm.
- (3) If the Committee finds the firm acceptable and determines that its inclusion on the design team would have no effect on the order of ranking in the original evaluation, a recommendation to approve the substitution will be forwarded to the GPSSB.

C. A Similar Procedure Will Be Followed if it becomes necessary to add a consultant to an approved design team. In that case the recommendation to the GPSSB would also include any additional fees associated with the services to be provided by the added consultant firm.

D. When Approved By The GBSSB, the Administrator will notify the prime firm in writing, authorizing the substitution or addition of a consultant firm.

E. In The Case Of An Addition Of A Consultant, a contract modification will subsequently be issued to the prime firm to incorporate additional fees to the base contract.

1.5 CONSULTANT AGREEMENTS WITH THE A/E: Consultants employed by A/E firms under contract with DGS are bound by the terms of the agreement between the A/E firm and DGS and this manual.

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2 PHASES OF (A/E) SERVICES

2.1 THE A/E AWARDED A CONTRACT for a project shall provide complete, professional services described in the Standard Form of Agreement with Architects/Engineers (Attachment 1 of this Manual) and, where appropriate, in the completed DGS Form GPSSB-20.

2.2 THE SIX PHASES OF A/E SERVICES ARE:

- A. Phase I - Schematic** including Program Verification and Concept Development when negotiated in the A/E Contract
- B. Phase II - Design Development**
- C. Phase III - Construction Documents**
- D. Phase IV - Bidding and Negotiating**
- E. Phase V - Construction**
- F. Phase VI - Post Construction**

NOTE: All six phases may not be required for some projects. In those cases, the OFP Project Manager (PM) will define the scope of services to be provided prior to fee negotiation.

3 AVAILABLE FUNDS

3.1 DESIGN BUDGET: The project design-to budget (estimated construction cost) will be provided to the A/E during fee negotiations. This design-to budget is typically based on the available or expected construction funds for the program construction costs. It includes the anticipated base construction costs and current market inflation. A/E fees, construction contingencies, construction inspection and testing expenses, and other incidental costs are excluded from the design-to budget. The A/E must not exceed this design-to budget throughout the design phases.

3.2 EXCEEDING BUDGET: At any phase of design, if the A/E determines that the program cannot be achieved within the design-to budget, the A/E shall notify the OFP PM immediately to discuss alternatives. Submission of cost estimates that exceed the design budget, without alternatives, will not be accepted by DGS.

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4 THE PROGRAM AND DESIGN CRITERIA

4.1 THE PROGRAM as delivered to the A/E and the A/E Qualification and Fee Proposals are firm regarding the scope of the project. The A/E is not authorized to make any changes to the program without written consent from the OFP PM.

NOTE: In addition to DGS approval, the Department of Budget and Management (DBM) must approve any changes to the program that will increase the cost by 7.5% or more or will increase the gross square footage by 5% or more.

4.2 DESIGN CRITERIA shall ensure that all State construction and renovation projects are -

A. Planned, Designed and Constructed to achieve efficient utilization of space and effective life cycle costs through application of sound economic and technical analyses by the A/E.

B. Economical To Construct, Operate and Maintain.

C. Designed As Sound Structures of conventional shapes that are attractive and functional.

NOTE: Special attention will be given to the economics of the interrelationship of architectural, structural, mechanical and electrical systems.

D. Planned And Designed without unnecessary features such as

- (1) low efficiency factors (see Building Efficiency Factors, Chapter IV, paragraph 5)
- (2) extensive roads, sidewalks, and parking to meet extreme requirements
- (3) elevated walkways
- (4) superfluous lighting to enhance aesthetic effects
- (5) grandiose landscaping schemes
- (6) specifying mature trees when standard size nursery stock will suffice

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E. Designed With Lighting Systems for high energy efficiency while maintaining IES recommended lighting levels.

NOTE: The A/E shall investigate the availability of energy incentive/rebate programs offered by the local utility company. Appropriate features will be incorporated into the lighting design to accrue the maximum benefit of such programs for the State.

NOTE: The A/E will comply with the National Energy Policy Act (DOE) prohibiting the manufacture of certain light sources.

5 CONSTRUCTION COST ESTIMATES

5.1 SUBMISSIONS: Cost estimates must be furnished by the A/E, in accordance with the Standard Estimating Format, Attachment 3 of this Manual, at each of the following phases of work:

A. When the Schematic Design Phase is complete and submitted for review.

B. When the Design Development Phase is complete and submitted for review. This submission should include the Life Cycle Cost Analysis and Energy Conservation Analysis requirements defined elsewhere in this manual.

C. When Contract Documents are 50% complete and submitted for review.

D. When Contract Documents Are 95% complete and submitted for review.

E. A Cost Estimate Shall Be Fully Developed for all projects with an estimated construction bid cost in excess of \$1.0 M or as otherwise directed by DGS. This requirement may only be waived by the OFP PM, in consultation with the Chief of the OFP Project Cost Center (PCC).

D. For Specific Projects, as identified in the Request for Proposal, a fully developed cost estimate will be required at the preliminary, conceptual level of design. Additionally, if the 95% CD's are not complete or substantially accurate, as defined by the OFP PM, a 100% CD cost estimate, fully developed, will have to be submitted by the A/E.

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Additionally, for specific projects, as identified in the Request for Proposal, a fully developed cost estimate will be required for post-bid analysis.

5.2 ESTIMATE QUALIFICATIONS: As it is essential that accurate estimates be provided, it is recommended that the A/E obtain certified, professional detailed takeoff estimates as soon as the drawings are sufficiently developed to realistically obtain such an estimate. On large, complicated projects, DGS may require such an estimate as part of basic services.

5.3 ESTIMATE SCHEDULE: Submission of the estimate with the associated phase design documents increases the likelihood of error, if the estimate is based on design data that may be out of date. The estimate must be based on the relevant design submission. The cost estimate can be submitted up to two (2) weeks after the submission of the current design phase documents package.

5.4 ESTIMATE FORMAT & CONTENT: All levels of estimates shall consider the project quality, whether material or assurance. The estimator, when appropriate, and acting in the best interest of the company, client or owner should apply value engineering techniques.

A. Estimate Levels for Various Sections (structural, mechanical, electrical) of a project in development may not be equal. State the variation of section levels in the status evaluation portion of the estimate narrative.

B. The Term Defined Area or System is the equivalent of terminology such as work breakdown structure, owner's special division of specified work, or syntax area. Prepare all levels of estimates by assigning defined areas or systems and state the costs for those defined areas or systems. Maintain the integrity of the Construction Specification Institute (CSI) numbering system within each of the defined areas or systems. The estimate should follow the CSI 16 Division format for construction.

C. The Estimate Should Be Produced Independent of any preceding estimate and should be based only on the documents (drawings, specifications, etc.) for the current stage of design. A new estimate should not be created by editing the old estimate based on "marked up or red lined" changes in the drawings.

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D. The Estimate Should Be Submitted in a Spreadsheet Format, preferably in a Microsoft Excel file. The use of electronic estimating program software is strongly encouraged. It shall contain a summary of estimated costs, alternates and notes (if any), a soft copy of the estimate spreadsheet file (via email attachment or CD-ROM), and a hard copy printout of the estimate (for verification purposes).

E. The Estimate Spreadsheet Formatting Criteria should include columns for the *item of work*, the *unit of measurement* of an item, the *quantity* of an item, the *unit cost* of an item, and the *total cost* of an item.

F. Escalation should be calculated from the estimate reference point to the estimated mid-point of construction. This time frame should be multiplied by an annual escalation rate to determine the percent of escalation to be used. The escalation rate should be determined based on market conditions and industry forecasts projected at the time the design occurs. The escalation rate calculation should be explained in the Note section of the cost estimate summary.

G. General Contractors Overhead & Profit, Bond Costs and Design Contingencies should be calculated in accordance with industry standard allowances at the varying levels of design and the current market conditions.

H. The DGS Cost Estimate Worksheet (Attachment 3a of this Manual) remains a standard requirement. However, a waiver may be requested, with full justification, by the A/E. The decision to grant the waiver will be made by the OFP PM, in consultation with the Chief of the OFP PCC.

I. Level One Estimate - Schematic Design

Prepare this level of estimate with information derived from the facility program plus outline design criteria with descriptions of the following items:

General description	Soil conditions
Geographic location	Labor hours by section
Quality	Foundation requirements
Layout	Rough sketches
Size	Rough utility quantities
Intended use	Construction type/size

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The purpose of this estimate level is to provide a better defined estimate for feasibility determinations.

J. Level Two Estimate - Design Development

Prepare this level estimate from not less than 25% complete preliminary design drawings and draft specifications. Information provided should include:

General site description	Engineered soil bearing
Preliminary structural design	conditions/reports
Site dimensions	Foundation sketches
Architectural construction	Preliminary mechanical dwgs.
Elevations	Preliminary plumbing dwgs.
General arrangements	Preliminary electrical dwgs.
Storm Water Management plans	Preliminary equipment plans
Sediment and erosion control plans	

The purpose of this estimate level is to establish probable costs within the range of available information. Continue defining labor hours in this level.

K. Level Three Estimate - Project Control / 50% Construction Documents (CD's)

Prepare this level estimate from design drawings and specifications that are at least fifty percent (50%) complete. Use the information from previous levels and add the following well-developed criteria:

Site and utility plans	General arrangements
Detail drawings	Mechanical drawings
Topographical maps	Electrical drawings
Engineered building equipment	Elevations
Engineered structural design	

This estimate level provides a greater amount of accuracy possible with better definition and detail. Use this level for value engineering applications before the completion of specifications and design drawings.

L. Level Four Estimate - Contract Drawings/95% CD's

Prepare this level estimate from not less than ninety five percent (95%) complete design drawings and specifications. This level shows the probable project cost.

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5.5 THE TRANSFER OF ESTIMATE INFORMATION TO FIELD COST CONTROL systems provides management the opportunity to closely monitor and control construction costs as they occur. Computer estimating and cost control programs, whether industry specific or general spreadsheet type, are especially valuable for rapid and efficient generation of both the estimate and actual construction cost information.

5.6 FOR QUESTIONS OR ADDITIONAL INFORMATION related to the cost estimate requirements, please contact the Chief of the DGS Project Cost Center @ 410-767-4397.

6 COORDINATION AND CORRESPONDENCE

6.1 COORDINATION: The OFP PM is the liaison between the UA and the A/E. The A/E shall notify the OFP PM of all conferences it would like to schedule with UA personnel sufficiently in advance of the intended meeting date to permit attendance of all appropriate personnel. Generally, the meetings will be scheduled at a DGS Facility.

6.2 CORRESPONDENCE: The A/E is responsible to prepare concise minutes of all conferences. Within five working days of a conference, the A/E shall distribute the original set of minutes to the OFP PM and copies to the UA and others as appropriate.

6.3 COPIES: Throughout project development, copies of all correspondence, estimates and other project matters shall be directed to the OFP PM. The A/E is responsible for distributing drawings and specifications for review to the OFP, the UA and other agencies. (See DGS Review Drawing Distribution, Attachment 2 of this Manual).

6.4 PRESS RELEASES: A/E's under contract with the State shall not issue press releases nor respond to inquiries from any media source without prior written approval from the Assistant Secretary, OFP. Inquiries from any media source shall be referred to the DGS Public Information Officer.

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7 PRESENTATION TO THE STATE BOARD OF ARCHITECTURAL REVIEW

7.1 REQUIREMENTS:

A. The Architectural Review Board (ARB) is established in accordance with State Finance and Procurement Article, Sections 4-701 through 4-704, Annotated Code of Maryland. The A/E may be required to make a Concept Presentation to the ARB after program verification early in the Schematic Phase. This requirement will be identified in the Technical Proposal Package distributed during the Procurement of A/E services. Typically, presentations to the ARB take place toward the end of the Schematic and Design Development Phases.

B. Notification: The A/E will be notified of date and time of the ARB meeting and will be advised of the time limit for the presentation to the ARB. The Using Agency will be notified by OFP of the meeting and will be encouraged to be present.

C. Considerations: The ARB will consider all factors affecting the project, including program, siting, adaptability to the master plan (if one exists) and architectural design. The ARB, in its comments and recommendations, will evaluate the functional and esthetic aspects of the project design, and evaluate whether the project can be built economically and consistent with sound construction practices and with minimum maintenance requirements.

D. Recommendations: After considering the submission, the ARB members will discuss their recommendations with the A/E. The A/E will be given the opportunity to reply to the ARB's comments.

E. The A/E Shall Record Minutes of the discussions and distribute within seven days.

7.2 CONCEPT PRESENTATION (30 minute review) shall include:

A. A Review of the budget and program.

B. Site Analysis including review of broader context and Master Plan (if one exists).

C. Video Or Photographs: The A/E may prepare a video tape of the site and surrounding structures. The video shall be

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keyed to a plot plan. The video shall have a maximum play time of 5 minutes. A photographic display may be prepared in lieu of a video tape presentation.

D. Program Organization

E. Current Development Of The Concept.

F. The A/E Shall Record Minutes of the discussions and distribute within seven days.

7.3 SCHEMATIC DESIGN PRESENTATION shall include:

A. Site Context Plan With Photographs

B. Landscape Concept discussing plant and paving materials

C. Preliminary Floor Plan layouts and elevations including mechanical equipment enclosures

D. Building Sections

E. Model Or Perspectives adequate to explain design

F. Discussion Of Potential Building Exterior Materials

G. Concept Of Major Interior Spaces

H. Record Minutes and distribute within seven days.

7.4 DESIGN DEVELOPMENT (DD) PRESENTATION: The Design Development Phase presentation will be required at the discretion of the Board. If required, it will include:

A. Refined Site Plan

B. Landscape Plan showing materials, patterns, and plants.

C. Photographs Of Context

D. A Review Of The Budget And Program

E. Boards representing plans, sections, and elevations that illustrate design

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- F. Physical Models** demonstrating massing and configuration.
- G. Selections And Samples** of major building materials and colors
- H. Interior Materials And Finishes** for major spaces
- I. Record Minutes** and distribute within seven days

7.5 ADDITIONAL PRESENTATIONS: Additional presentations of the schematic or design development phase may be required to resolve design concerns. When subsequent meetings are required, all previous submissions shall be made available by the A/E to the ARB. All costs associated with additional presentations shall be borne solely by the A/E unless there are special circumstances acknowledged by the OFP.

8 VALUE ENGINEERING:

8.1 THE OFP WILL UTILIZE VALUE ENGINEERING on all projects valued at \$10 million and greater, and on selected projects under \$10 million. Value Engineering Workshops will be conducted at the end of the Schematic Phase and the end of the Design Development Phase.

8.2 THE A/E DESIGN TEAM WILL CONDUCT A PRESENTATION for the Value Engineering Team at the beginning of each Value Engineering Workshop to explain the design concepts and documentation that have been developed during the respective phases. This presentation and subsequent discussion will last approximately four (4) hours.

8.3 THE A/E DESIGN TEAM WILL ALSO PARTICIPATE in the wrap up meeting after each Value Engineering Workshop. At that meeting the Value Engineering Team will present their findings and recommendations for cost saving measures to the OFP, the Using Agency and the A/E Design Team. This meeting will last approximately four (4) hours.

8.4 THE A/E DESIGN TEAM WILL REVIEW THE VALUE ENGINEERING REPORTS produced and furnish written responses to the OFP Project Manager on the specific recommendations.

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9 CERTIFICATION OF CONTRACT DOCUMENTS

9.1 PROFESSIONAL CERTIFICATION: The following certification shall be placed on the cover sheet of the set of Contract Drawings and the seal and signature page of the Project Manual specifications book:

"The Contract Documents for the indicated public improvement were prepared under my supervision and, to the best of my knowledge, information and belief, they comply with the relevant building codes of the State of Maryland."

9.2 SEAL AND SIGNATURE: All CD's (original drawings and the seal and signature page of the specifications) shall bear the seal and signature of the primary A/E. Also, the seal and signature of each consultant to the primary A/E shall be affixed on drawings and specifications within their area of responsibility.

9.3 CARE OF CONTRACT DOCUMENTS: It is the responsibility of the A/E to maintain Contract Document CADD and word processor files in secure storage until they are delivered to the OFP as fully corrected "as-built" record documents.

9.4 APPROVAL OF CONTRACT DOCUMENTS BY THE STATE does not relieve the A/E of responsibility for:

- A. The Accuracy and Completeness of All Documents.**
- B. Compliance with Required Standards, Codes, Ordinances or Other Applicable Regulations.**
- C. Compliance with the Standard of Care** governing the A/E's performance.

10 PAYMENTS FOR PROFESSIONAL SERVICES

10.1 SCHEMATIC/DD CONTRACT: If only Schematic and/or DD phases are included in the A/E contract, payment is made on the basis of the phases as set forth in the DGS Standard Form of Agreement with the A/E.

10.2 FULL/PARTIAL CONTRACT: If the A/E has a full or partial services contract, payment requests shall be in the standard form shown on Attachment 7 of this Manual. If the A/E has extra work on

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a Not-to-Exceed basis, payment requests shall be in the form shown on Attachment 8 of this Manual.

10.3 PAYMENT REQUEST: Invoices may be presented at the beginning of each month covering the costs of service during the previous month.

10.4 REQUIRED INFORMATION: The A/E shall submit one copy of the current Monthly Progress Report (Attachment 5 of this Manual) with each payment request. This is in addition to the monthly submission required in Division II, paragraph 2.1.

10.5 REQUIRED SERVICES: All services required by DGS Form GPSSB-20 must be provided prior to DGS approval of each phase and prior to DGS approval of A/E invoices for payment of applicable fees.

10.6 FINAL PAYMENT

A. Final payment of the A/E's **Phase V** fee shall be payable upon submission of "as-builts".

B. Final payment of the A/E's **Phase VI** fee shall be payable upon completion of the 23 month Post Construction inspection, in accordance with Chapter II, paragraph 16.

CHAPTER II

TITLE: PROCEDURES	Revised: July 2003
Responsible Organization: Office of Facilities Planning	
Instructions: This procedure supersedes the DGS Procedure Manual for Professional Services, dated July 1998. Please recycle the superseded document.	

GENERAL

1 CONFERENCES

1.1 PRE-DESIGN CONFERENCE

A. General: As soon as practicable after an A/E has been assigned to a project, the Office of Facilities Planning (OFP) Project Manager (PM) will call a conference to initiate the first general review and discussion of the project. This meeting will include the A/E, a representative of the Using Agency (UA), the OFP PM and Design Team Personnel.

B. Topics: At this conference, the following will be furnished and reviewed with the A/E:

- (1) Procedure Manual for Professional Services
- (2) DGS Project Number to be used on all correspondence, drawings, specifications, estimates, shop drawings, invoices, and other matters relative to the Project.
- (3) Program: the approved project Program
- (4) Statements in the program addressing the presence or absence of hazardous materials
- (5) "Design-to" funds available for the project
- (6) Names and phone numbers of UA personnel with whom the A/E may coordinate details
- (7) Names of DGS personnel with whom the A/E will coordinate all work e.g. PM, Design Team, etc.
- (8) Date and authorization for site visit
- (9) Licensing and permit requirements e.g. Federal, State, Local, etc.
- (10) Phase Schedule showing start and completion dates for all phases of the A/E contract including:
 - Program Verification
 - ARB Presentation
 - (a) Schematic Design - including, as negotiated, Program Verification, Concept Development, ARB

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- Presentations, Value Engineering Workshop, Schematic Documents Submission to DGS
- (b) DGS/UA Schematic Design Review
 - (c) Design Development - including, as negotiated, ARB Presentation, Value Engineering Workshop, DD Documents Submission to DGS
 - (d) DGS/UA Design Development Review
 - (e) Construction Documents
 - (f) DGS/UA Review-50% CD, 95% CD, & 100% CD
 - (g) Bidding & Negotiation
 - (h) Construction Administration
- (11) Review Drawing Distribution: for each review submission, the A/E will be responsible to distribute the number of review sets to the respective agencies listed on Attachment 2 of this Manual.
 - (12) Additional Information that the A/E may need to complete the Schematic Phase.
 - (13) Special DGS Policies applicable to the project, such as roofing, energy conservation, and green/sustainable design, etc., described in other chapters and attachments of this Manual.
 - (14) Available Information: all site, utility, topographic, and master plan information; all available data for existing facilities undergoing project renovations, alterations or additions.
 - (15) Standard Submission requirements, including drawings, specifications, geotechnical report, calculations, areas/volume/efficiency summary, monthly progress report, etc.
 - (16) Program verification process and procedures to effect program changes, if it becomes necessary.

1.2 OTHER CONFERENCES

A. DGS Will Schedule Conferences to discuss review comments and resolve problems relating to design submissions at the conclusion of each design phase (Schematic, DD, CD) and at other times as needed.

NOTE: The Architect and appropriate Consultants are required to attend all relevant conferences. The UA will be represented at all review conferences.

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1.3 DOCUMENT REVIEW PROCEDURES

- A. **Review Comments Will Be Electronically Transmitted** from the OFP PM to the A/E.
- B. **The A/E Shall Review the Comments** and respond by typing a substantive response directly below the OFP comment.
- C. **The A/E Shall Return the Comments** to the OFP PM via e-mail within ten working days of initial receipt.

2 REPORTS DUE WITH SUBMISSIONS

2.1 MONTHLY PROGRESS REPORT

- A. **Requirements:** The A/E shall provide the OFP PM a Monthly Progress Report (see Attachment 5 of this Manual) for all phases of design no later than the first day of the month immediately following the end of the report month. The report shall cover work completed for the entire month. A monthly report will be submitted until a construction contract is awarded.
- B. **Schedule:** The Monthly Progress Report will be completed progressively so that each submission includes prior status dates as well as current status. Estimated dates of completion of all design phases under the A/E contract will be furnished, as well as other information indicated on the form.
- C. **Delays:** The schedule will clearly show (in "Remarks") the reasons for delays, e.g. program clarification, revisions, awaiting survey information, awaiting tests or borings, permits from MDE, Corps of Engineers, lack of funds, agency delays, review delays, etc. Include the dates that each delay started and ended.
- D. **Completion Percentages:** Overall percentages of completion will take into account the status of both drawings and specifications of each of the individual disciplines involved in the project. In general it is considered that drawings constitute 3/4 of the work and specifications 1/4 of the work.

- 2.2 **PROJECT DESCRIPTION SHEET:** The A/E shall complete and submit the original and two copies of the Project Description Sheet (see Attachment 6 of this Manual) with the DD submission, the

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50%, 95% & 100% CD submissions, and other times on request from DGS

3 AREAS, VOLUMES and EFFICIENCY TABULATION

3.1 AREAS, VOLUMES AND EFFICIENCY TABULATIONS are required for all new buildings and additions; they may also be required for alterations and renovations. Measurement and computation guidelines are described in Appendix D of this Manual.

3.2 FORMS: Use DGS Form, Summary Areas, Volumes & Efficiency, Attachment 4 of this Manual.

3.3 CONTENT: Submissions at each phase will include the tabulations for that phase, as well as the tabulations of the program and all prior phases (based on the approved plans of the prior phases). Show all information on the same form.

3.4 COPIES: Submit in triplicate to the OFP PM.

3.5 SCHEDULE: The A/E shall submit on the Attachment 4 form current detailed tabulations of areas, volumes and efficiencies with the submission of plans as follows:

- A. Schematic Phase** - Additionally, on each architectural floor plan, the actual net assignable and the programmed net assignable area will be noted for each programmed space.
- B. Design Development Phase**
- C. Construction Document Phase** - Mid-point Review (50%) and Final Review (95%)
- D. Other interim submissions** when requested.

4 SUB-SURFACE EXPLORATION AND EVALUATION

4.1 REQUIREMENTS for the sub-surface exploration and evaluation program to be undertaken by the geotechnical engineering consultant are documented in Appendix A of this Manual.

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5 FOREST CONSERVATION PROCEDURES

5.1 REQUIREMENTS: In accordance with Natural Resources Article, Title 5, Forest and Parks, Subtitle 16, Forest Conservation, all construction activities involving but not limited to clearing, grading, erosion and sediment control on areas greater than 40,000 square feet by a unit of State government or any person using State funding for a construction project, shall require a "Forest Stand Delineation" and a "Forest Conservation Plan" for submission to and approval by the Department of Natural Resources, Resource Conservation Service, Forestry Division.

5.2 SITE: Subsequent to preparation of a "Forest Stand Delineation", in accordance with DNR Article, Title 5 and as an integral part of the site planning process, a "Forest Conservation Plan" shall be prepared and submitted which outlines the proposed forest retention, reforestation, afforestation and/or forest protection procedures associated with the proposed land use change.

5.3 CONSERVATION FUND: If site and development constraints preclude the aforementioned "Forest Conservation Procedures", then a monetary contribution to the Conservation Fund shall be made at the rate of 10 cents (\$0.10) per square foot of the area requiring planting as determined by the "Forest Stand Delineation" and the "Forest Conservation Plan".

6 CHESAPEAKE BAY CRITICAL AREA CONSIDERATION

6.1 REQUIREMENTS: A/E's are required to incorporate the Chesapeake Bay Critical Area and Wetlands Regulations administered by the Chesapeake Bay Critical Areas Commission, Department of Natural Resources, into the design of construction projects.

6.2 CRITICAL AREAS COMMISSION (CAC) APPROVAL: For projects which have received general approval from the CAC, the A/E will be responsible for submitting Schematics, 50% and 95% construction documents to the CAC. In all instances, one copy of the transmittal letter acknowledging receipt by the CAC shall be submitted to the DGS Project Manager. The A/E shall provide to DGS, two copies of the CAC's letter which indicates their approval of each phase of the proposed design.

6.3 FORMAL PRESENTATION: The A/E may be required to make formal presentations to the CAC.

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7 CONSTRUCTION DRAWINGS

7.1 GENERAL

A. CADD: A/E's shall produce construction and as-built drawings by Computer-Aided Design & Drafting (CADD) methods. Similarly prepared documents shall be required from all disciplines.

B. Material: Bid Ready Construction Drawings must be delivered both on Mylar drafting film and on a compact disk with the drawings in tif format. As-Built Drawings shall be delivered on two compact disks, one with CADD files and the second with tif files.

NOTE: Reproducible prints are not acceptable in lieu of Mylar drafting film without prior approval in writing from the OFP PM.

C. Sheet Size: Drawings shall normally be 24" x 36" sheets. If circumstances require the use of a larger sheet, the OFP PM will authorize an acceptable size, typically 30" x 42". All drawings in the set shall be the same size sheet.

D. Lettering Size: A minimum 3/32 inch lettering shall be used. All line work shall be of sufficient density to provide uniform reproduction and photographic quality, and shall be readable when reproduced at half size.

E. Orientation: All drawings shall be prepared with the same orientation.

F. Scale of Drawings: Scales noted in specific drawing types are minimum. No other scales shall be used for Plans or Elevations unless prior written approval is obtained from the OFP PM. All sheets must contain both written and graphic scales.

G. North Arrow: All plans shall include a North arrow.

H. Overall and Detail Drawings for each discipline shall include all dimensions necessary to size and locate the features shown.

NOTE: References to other disciplines for dimensions (except for coordination) shall not be used.

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I. Cross References: Drawings shall depict keys to materials, symbols, abbreviations, and adequate schedules providing a cross-reference of drawings to specifications.

NOTE: The use of drawing note tabulations with reference letters or numbers noted on plans and details is not acceptable without prior written approval of the OFP PM. Such notes shall be written adjacent to the respective architectural or structural element, mechanical equipment item or mechanical system component, or electrical equipment item or electrical system component.

7.2 COVER SHEET (Attachment 11 of this Manual)

A. All Contract Drawing Sets, regardless of design phase, shall have a cover sheet with the following information:

- (1) Name of Project
- (2) DGS Project Number
- (3) Location-complete address including County
- (4) Secretary of DGS and DGS' address
- (5) Board of Public Works (Governor, Comptroller & Treasurer)
- (6) Consulting Firms: Names, addresses & telephone numbers
- (7) Vicinity Map, with North arrow, to locate the project site within a geographic region showing its proximity to major features such as a city, towns, major interstate highways, or other known geographic features.
- (8) Location Map, with North arrow, to show how to access the project site from the nearest major roadways or streets shown on the Vicinity Map.
- (9) Code Design Information e.g. date of Code, use group, construction classification, fire rating, total gross area, total net area, building height.
- (10) List of drawings

NOTE: For large projects, items (9) and (10) may be provided on the next sheet(s) after the Cover Sheet.

B. State Signatures: A signature block for DGS and UA signatures is required on the Cover Sheet only. DGS and UA signatures are not required on the architectural and engineering drawing sheets.

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7.3 ARCHITECTURAL AND ENGINEERING DRAWINGS

A. Title & Signature Block shall include: (complete Option #1 or Option #2 as shown on Attachment #12 of this Manual)

- (1) Title of Sheet, e.g. FIRST FLOOR PLAN, FINISH SCHEDULE, etc.
- (2) Title of Project as stated in the contract.
- (3) The DGS Project Number must appear on all drawings, specifications, contracts, shop drawings and correspondence.
- (4) Date drawings completed.
- (5) Revision block
- (6) Drawing numbers shall be given to all sheets and the sheets sequentially numbered.

NOTE: If more than one scheme is prepared indicate the Scheme numbers.

- (7) Location of job, e.g. SPRINGFIELD STATE HOSPITAL, SYKESVILLE, etc.
- (8) Architects' and Engineers' names, seals, etc. may be placed to the left of the above title arrangement or in other locations as necessary.
- (9) The Primary A/E is required to sign all drawings under his Seal. Consultants to the primary A/E must sign all drawings prepared by their office under their Seal.

B. Drawing Numbers: Divide the sheets into groups according to disciplines and use the following letter prefix for each: **A** for architectural; **C** for civil/site; **L** for landscaping; **S** for structural; **M** for mechanical; and **E** for electrical.

NOTE: If a project requires drawings of specialty areas e.g. data/communication, security, audio/visual, or food service, a prefix for sheet numbering shall be recommended to the OFP PM for approval.

C. The Site Plan Shall:

- (1) be drawn using a minimum scale of 1" = 40.0'.

NOTE: Architectural scales shall not be used.

- (2) show all existing buildings and structures, roads, walks, utilities, flood plains, forest stands, wetlands and critical areas within a radius of 200 feet (minimum) of the proposed structure.

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NOTE: Some projects may require a larger radius.

- (3) shall indicate proposed site improvements, grading, access, parking areas, utilities, etc.
- (4) shall show future buildings adjacent to the proposed project and proposed structures if a master plan exists.
- (5) shall also depict grading, drainage, planting, lighting, access, sediment and erosion control, and storm water management within the limits of the contract.

NOTE: When required by MDE, complete Sediment and Erosion Control, and Stormwater Management Plans shall be submitted at each design phase after schematics, including the Engineer's and DGS' Certifications. (see Appendix B)

D. Storm Drain and Site Utility Profiles shall be drawn using scales of 1"=40'-0" horizontal and 1"=4'-0" vertical (vertical to horizontal exaggeration = 10/1).

E. Demolition Drawings shall clearly show existing conditions, what work is to be removed, and a reference provided to the drawing that shows the proposed work for the same area.

NOTE: If hazards are identified, e.g. lead, asbestos, PCB, chemicals, etc. the Demolition Plan and related notes shall describe the location and refer to the specification section which shall specifically reference the applicable regulations and describe the removal and disposal of the hazardous materials.

F. Architectural Drawings

- (1) Building Plans and Elevations shall be drawn using a 1/8" = 1'-0" scale.

NOTE: Other scales shall not be used unless approved otherwise in writing by the OFP PM.

- (2) Floor Plans shall
 - (a) be double line, drawn to a 1/8" = 1'-0 scale.
 - (b) show complete arrangements of all spaces with relation to structural system components and mechanical and electrical equipment spaces.
- (3) Elevations shall graphically depict all design elements and materials to be used.

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G. Structural Drawings shall include the following notes on one of the drawings:

- (1) Design Dead Load Data, including Partition Load and Live Load, for all areas of the building the roof.
NOTE: Allowances shall be included, wherever applicable, for additional loads due to mechanical equipment, piping, ceilings, etc.
- (2) Design Bearing Value for all spread footings, caissons, and the Bearing Load for all piles.
- (3) Concrete strength required for each part of the building.
- (4) Steel Yield Point Strength for all reinforcing and structural steel.

H. Permanent Excavation Measures, such as Retaining Structures, Dewatering Systems, etc., plans and specifications shall be included (when required) in the construction drawings.

I. Mechanical And Electrical Drawings

- (1) The first sheet of the HVAC system drawings shall summarize total heat loss for the building, heating and air conditioning loads in BTUs, heating design temperatures and humidity inside and outside, total heat gain and ventilation load for the building in BTUs, and maximum gas consumption in cu ft/hr (if applicable).
- (2) The first sheet of the plumbing system drawings shall summarize total plumbing fixture units, maximum domestic water demand in gph, domestic hot water load in BTUs, and maximum gas consumption in cu ft/hr (if applicable).
- (3) Mechanical and electrical plans shall be developed to show complete layout of Plumbing, Heating, Ventilating and Electrical systems.
- (4) All ductwork shall be double line except in areas where not more than one duct is shown.
- (5) All mechanical work shown or detailed on more than one sheet shall be cross referenced.
- (6) All building spaces shown on mechanical and electrical drawings shall be identified on the drawings. Room titles or numbers must be placed directly on the related spaces without interfering with any other dimensions or data. If room numbers

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are shown, a table with room numbers and names shall be included elsewhere on the sheet.

- (7) Mechanical or Electrical drawings shall provide complete temperature control schematics and detailed operating sequences.
- (8) Electrical drawings shall provide descriptions, features, and interface definitions for the telecommunications system.

8 CONSTRUCTION SPECIFICATIONS

8.1 GENERAL REQUIREMENTS FOR THE PROJECT MANUAL

A. The Cover Page shall include required information depicted on Attachment 13 of this Manual. The A/E shall include a "mock-up" with the review sets of Specifications as the names of various State officials change.

B. Seal Page: One page of the Specifications (following the cover page) shall contain the Project Title, DGS Project Number, the professional seal and signature of the primary A/E firm, and the professional seal and signature of each consultant firm on the A/E team.

C. The Table Of Contents shall list all division and section numbers and titles in CSI protocol. Indicate the page numbers where the specification can be found following the section number and title. If the project does not include any work in a specific division, note "none" under page number.

D. Sequence Of Project Manual Contents:

- (1) Title Page
- (2) A/E Seals & Signatures
- (3) Table of Contents
- (4) List of Drawings
- (5) Wage Rates (see paragraph 9 of this Division)
- (6) Division 1 through 17 Specification sections

E. Format: The A/E shall follow the Construction Specifications Institute Sixteen Division Master format and Three Part Section format.

F. Job Conditions: Statements relative to unusual job conditions, security requirements, etc., shall be included in

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Division 1 of the Specifications.

G. Proprietary Information: Where trade name or "brand name" products are included, at least three acceptable brands shall be named, if possible, along with the reference "or approved equal".

H. Hardware Schedules are required in the specification. They shall be open to full competition. The A/E shall determine the requirements of the UA for the Master Key System.

I. General References to other specification documents shall be avoided wherever possible, e.g. reference to County, SHA or WSSC specifications. If such specifications govern, the complete reference shall be reprinted.

8.2 INSTRUCTIONS TO BIDDERS AND GENERAL CONDITIONS

A. The A/E Shall Read and Comply with DGS' Instructions to Bidders and General Conditions. The Division I Specifications shall be edited to eliminate any sections that conflict with DGS' Instructions to Bidders and General Conditions.

B. These Documents Are Standard for All Projects and are available through the DGS Office of Procurement and Contracting. They may not be altered by the A/E. Supplemental or special conditions may not be used without prior written approval of the Assistant Secretary, OFP.

C. Reference Shall Be Made to the Latest DGS General Conditions in appropriate divisions of the specifications.

8.3 ELECTRICAL HIGH VOLTAGE WORK (over 600 volts)

A. If a Project Involves High Voltage Work, the contractor shall utilize the services of an independent high voltage electrical testing agency.

B. The Project Specifications Shall Read as Follows Where Appropriate:

- (1) The contractor shall secure and pay for the services of a high voltage electrical inspection agency to test and inspect all electrical high voltage components of the system prior to being

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energized. The tests and inspections shall follow the procedures as established by NETA in their specifications for acceptance testing. The contractor shall submit a copy of the test results and an analysis of the results prepared by a registered Professional Engineer to the A/E and to the DGS PM within ten days of the testing.

- (2) Repeat testing due to unacceptable test results and/or inspection findings shall be the sole responsibility of the contractor.

C. The Following Statement Shall Be Included in the appropriate sections of the electrical specifications:

- (1) An electrical certificate from an independent (non-governmental) electrical inspection agency approved by the State of Maryland Fire Marshal must be submitted to DGS prior to or with the final payment invoice. The inspection certificate shall be used in lieu of a county or municipal permit for electrical work performed on property belonging to the State of Maryland. The electrical sub-contractor shall file with the independent inspection agency, and pay all fees associated with such filing, at the start of construction so that adequate rough-in inspection can be made during the course of work.

8.4 HEATING, VENTILATION, AND AIR CONDITIONING SYSTEM WORK

A. The Following Requirements Shall Be Included in the appropriate section of the mechanical specifications for projects that involve the installation or service of heating, ventilating, air conditioning, or refrigerating (HVACR) systems:

- (1) A mechanical contractor bidding as prime contractor shall be a Maryland-licensed HVACR Master or Master Restricted contractor qualified in the areas of work included in the project.
- (2) The prime contractor shall agree to employ only individuals holding valid licenses issued by the State HVACR Board of the Department of Labor, Licensing and Regulation (DLLR) to provide, or assist in providing, HVACR system installation or

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- service required for the project.
- (3) If the prime contractor subcontracts any of the HVACR system installation or service required for a project, the subcontractor must possess appropriate licenses issued by DLLR for the work to be performed. Employees of the subcontractor that provide or assist with HVACR system installation or service must hold appropriate licenses from DLLR for the work being performed.

8.5 UTILITY PERMITS AND CONNECTIONS

A. The A/E Will Be Responsible For Coordinating with any and all local and State regulatory agencies and public utility companies to identify those permits and approvals necessary to make utility connections to available public, private or municipal water, sewer, storm sewer, gas, electric, communication, and data services or to construct the necessary on-site sanitary facilities to support the building project in its entirety.

B. Utility Owner Approval: The A/E will obtain from the owners of the utilities, the necessary approvals for connection to same and an estimate of the connection fee.

C. Trade Permits: Mechanics and/or trade permits will be obtained by those trades as required of them.

D. The A/E Shall Include In The Project Manual a Division 1 specification section defining the Contractor's responsibility for utility permits and connections and how payment will be made to the utility owner. The specification section will also establish bid allowances for the costs of the required utility connections. The specification shall be as written in Appendix F of this Manual.

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9 PREVAILING WAGE REQUIREMENTS

9.1 PROJECTS ESTIMATED TO COST \$500,000 or more shall

A. The A/E Shall Apply To The Commissioner Of Labor And Industry for a Prevailing Wage Rate Determination. (see Attachment #9 of this Manual). When received, the Wage Rate Determination shall be included in Division 1 of the Construction Specifications.

B. Application Must Be Made For Wage Rates 60-120 days in advance of the time the project goes to bid. The A/E shall furnish sufficient information to permit complete listing of all crafts.

9.2 FEDERAL FUNDS

A. The A/E Shall Apply For A Federal Wage Scale when Federal funds are involved, and if Federal regulations (Davis-Bacon Act) require the use of a federal prevailing wage schedule.

B. If Federal Wage Scales Change from the initial application by the A/E, new rates must be applied for and issued as an addendum.

C. If, After An Addendum Has Been Issued with new rates, and Federal wage rates change within 20 days of the bid date, it will not be necessary to apply for new wage rates.

NOTE: Information on Federal wage rates can be obtained from the Federal Register, Procedures for Predetermination of Wage Rates.

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DESIGN PHASES

10 PHASE I - SCHEMATICS - In addition to the requirements listed in Table II-1 at the end of this chapter, the following are required during the Schematic Phase of design:

10.1 FLOOR PLANS shall

- A. Show Overall Dimensions.**
- B. Show Door, Window, Elevator, Stair, Corridor, and Exit Locations.**
- C. Identify All Major Rooms, Areas and Spaces** by name, actual net square footage, and programed net square footage.
- D. Contain a Note Below the Plan** indicating the approximate gross square feet and the net assignable square feet for each floor e.g. basements, mechanical floors, penthouses, etc.

NOTE: The first floor plan of multiple story buildings shall contain a summary of Areas, Volumes and Efficiency for the entire building. (See Division II, paragraph 3)

10.3 ELEVATIONS: Block elevations of all sides shall be drawn using the same scale as the floor plans, unless otherwise approved by the OFP PM.

10.4 SECTIONS

- A. Longitudinal Sections and Transverse or Cross Sections** of the building are required.
- B. If the Building Has a Variety of Unique Spaces** with varying heights and/or shapes the A/E shall supply as many sections as necessary to clearly convey the schematic design intent of the space or building.
- C. Sections Shall Be Developed** using the same scale as Floor Plans and Elevations.

10.5 LIFE CYCLE COST ANALYSIS (LCCA) AND ENERGY CONSERVATION

- A. During the Schematic Phase,** the A/E recommend at least four alternative HVAC systems to be studied in a LCCA, one of

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which shall be a geothermal heat pump system.

B. The Completed Analysis shall be included in the design development submission in accordance with the procedures for Implementation of Life Cycle Cost Analysis described in Chapter VI of this Manual.

11 PHASE II - DESIGN DEVELOPMENT (DD) - In addition to the requirements listed in Table II-1 at the end of this chapter, the following are required during the DD Phase of design:

11.1 BUILDING CODE ANALYSIS TABLE AND MEANS OF EGRESS PLAN DRAWINGS

A. A Building Code Analysis is required for all buildings.

B. The Analysis shall include:

- (1) Applicable Codes
- (2) Use Group Classification
- (3) Construction Type
- (4) Building Area and Height Limitation
- (5) Fire Resistance Requirements
- (6) Specific Use Area Separation
- (7) Occupant Load
- (8) Egress Capacity Calculation
- (9) Travel Distance

NOTE: Plans for multi-story buildings shall show this information for each floor.

C. Projects Greater Than 10,000 Square Feet: an egress plan depicting the building code analysis shall be provided.

- (1) The plan may be a single line drawing with all major rooms, corridors, stairs, elevators, fire separations and smoke partitions identified, and directional egress arrows and travel distances shown.
- (2) Include a separate drawing at the start of the architectural plans in the contract drawings.

D. Projects Less Than 10,000 Square Feet: the building code analysis may be on the Cover Sheet or first architectural plan.

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11.2 FLOOR PLANS SHALL:

A. Show the Following - Door, Window, Elevator, Stair, Corridor and Exit Locations, and furniture layouts.

B. Depict Major Rooms, Areas and Spaces by Name and Gross Square Footage.

C. Contain a Note Below the Plan indicating the approximate gross square feet and the net assignable square feet for each floor, including basements, mechanical floors, and penthouses.

NOTE: The first floor plan of multi-story buildings shall contain a summary of Areas, Volumes and Efficiency for the entire building.

11.3 ELEVATIONS shall be developed to a degree sufficient to establish character of design, materials, textures, and color.

11.4 SECTIONS shall be drawn at 3/4" = 1'-0" scale to illustrate floor to floor heights, ceiling heights, changes in elevations, typical construction, etc. Wall sections shall initially be provided in the Design Development Phase documents.

11.5 ENGINEERING DRAWINGS SHALL:

A. Be Prepared for Each System, e.g. Structural, Civil, Plumbing, Heating, Ventilating, Air Conditioning and Electrical Distribution.

B. Show Equipment Layouts for Specialized Rooms such as laboratories; mechanical rooms, electrical rooms, kitchens, food serving areas, etc.

C. Show Lighting, Receptacles, Telephone and Special Systems Layouts.

NOTE: Single line drawings may be submitted that depict sufficient detail to convey the intent of the systems.

11.6 MECHANICAL DRAWINGS SHALL:

A. Depict Proposed Locations e.g. mechanical rooms, roof, etc. for HVAC, plumbing, and fire protection equipment.

B. Dimension Required Clearances for servicing and removing

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equipment, including equipment installed above ceilings.

C. Provide Schematic, Single Line Diagrams for the HVAC, plumbing and fire protection systems, depicting the various components e.g. air and water distribution, controls, etc.

D. Provide a List of Energy Efficient Equipment.

NOTE: The drawings shall depict sufficient detail to convey the intent and performance of the selected system.

11.7 ELECTRICAL DRAWINGS SHALL:

A. Include a Site Plan showing the primary telephone, fiber and electric power lines, duct banks and their associated manholes, utility transformer location, and generator location(s).

B. Include Building Plans showing both proposed exterior and interior lighting fixture layout, all wiring devices, e.g. receptacles, telephone/data, lighting switch locations, special systems layout e.g. fire alarm, security, etc., and public address system.

C. Include Detailed Single Line Power and Fire Alarm Riser Diagrams.

D. Include Blank Panel, Switchgear and Motor Control Center Schedules.

NOTE: No circuiting is required for this submission.

11.8 OUTLINE SPECIFICATIONS

A. Outline Specifications for Architectural, Structural, Site Improvements, Civil, Mechanical and Electrical work shall be Included with the DD submission.

B. Content Shall:

- (1) clearly define all components of each of the systems and all materials that are intended to be used on the project.
- (2) clearly define the components for HVAC, plumbing, fire protection and underground utilities of each system, as well as all materials and methodology of

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installation.

- (3) provide a narrative description of HVAC and plumbing systems for all spaces in the building including equipment and controls considered in the Life Cycle Cost Analysis, and provisions for implementation of energy conservation measures.

11.9 ELECTRICAL CALCULATIONS

A. Requirements

- (1) Load and demand analysis
- (2) Load analysis for stand-by power systems
- (3) Lighting power budget per latest revisions of ASHRAE/IES 90.1
- (4) Lightning risk assessment per NFPA 780, Appendix I

NOTE: One copy of these preliminary calculations shall be submitted with the DD presentation.

NOTE: Annotate all references used to develop calculations.

11.10 MECHANICAL CALCULATIONS: Submit one copy of building and system load calculations for HVAC and plumbing systems.

11.11 LIFE CYCLE COST ANALYSIS

- A. During the Schematic Phase,** the A/E was required to submit for approval at least four alternative HVAC systems to be studied in a life cycle cost analysis. The completed analysis shall be included in the design development submission.
- B. The Analysis Shall be Prepared** in accordance with DGS' Procedures for the Implementation of Life Cycle Cost Analysis and Energy Conservation described in Chapter VI of this Manual.
- C. For Energy Conservation** the building exterior envelope shall comply with the envelope requirements of ASHRAE 90A and 90B, or CABO Model Energy Code Chapter 8, as per the BOCA National Energy Conservation Code, latest edition.
- D. The Goal for Minimum Requirements Shall be:**
 - (1) New Buildings:

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- (a) Walls (gross area) - R12
 - (b) Roofs (gross area, low slope roof) - R20
 - (c) Roofs (gross area, steep slope roof) - R30
 - (d) Windows - double glazed insulating glass, thermal-break, low e coating, maximum window (glass only) U value of 0.49, and maximum shading coefficient of 0.55.
- (2) Renovated Buildings:
- (a) Walls (gross area) - R8
 - (b) Roofs (gross area, low slope roof) - R16
 - (c) Roofs (gross area, steep slope roof) - R30
 - (d) Windows - Replacement windows shall meet the above goal requirements of new buildings. If the existing windows to remain are only single-pane they shall be equipped with storm windows.

E. If the Above Requirements Are Found to Be Non-attainable or that they would not result in energy conservation, such findings shall be submitted to DGS for review and direction.

12 PHASE III - CONSTRUCTION DOCUMENTS (CD) - In addition to the requirements listed in Table II-1 at the end of this chapter, the following are required during the CD Phase of design:

12.1 GENERAL REQUIREMENTS

A. Initial CD Review Submission is at approximately 50% completion.

B. Drawings: 50% CD Submission is defined as 50% completion of all drawings planned at that point to constitute the final set of CD's for Architectural, Engineering, and Site drawings.

- (1) Electrical drawings shall contain circuiting for power and lighting for this submission.

NOTE: Review sets shall be marked "FOR REVIEW ONLY, NOT FOR CONSTRUCTION".

C. Specifications: 50% CD Submission is defined as a Draft Copy of the Final CD's for Architectural, Engineering, and Site Specifications including edited specifications of all sections related to the project. Unedited Master

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specification sections are not acceptable.

12.2 CALCULATIONS

A. Preliminary Structural Calculations shall be submitted for all elements that are designed or sized by the structural engineer.

B. Mechanical Calculations shall be submitted presenting finalized load calculations for HVAC and Plumbing Systems, and equipment selection. Provide all input values used in the calculations e.g. design temperatures, occupancies, U or R values, etc.

C. Electrical Calculations shall be submitted for the following with 50% CD's, and updated copies with subsequent submissions:

- (1) Updated DD calculations
- (2) Load analysis for stand-by power systems, including sizing calculations for stand-by equipment.
- (3) Short circuit analysis using ohmic or per-unit method depending on system complexity (Reference IEEE Transactions on Industry and General Applications, Vol. 3, Number 2, March/April 1967).
- (4) Voltage drop analysis
- (5) Power factor correction
- (6) Lighting calculations (interior and exterior)
- (7) Pole classifications, guy vector diagrams and guy strength when overhead transmission systems are involved.
- (8) Depict on the first sheet the total electrical load in KVA, total lighting and receptacles in KVA, total power in KVA, largest motor HP, estimated emergency power demand in KVA, and the type and size of stand-by power units.

NOTE: Present all calculations in an organized format and depict all references used preparing calculations.

NOTE: Calculations previously submitted at the DD phase shall be updated for this submission.

12.3 SITE IMPROVEMENT DRAWINGS

A. Depict All Existing and Proposed Conditions, materials,

CHAPTER II PROCEDURES

structures, fixtures, elements, etc. with sufficient detail to establish location, alignment and grade.

B. Storm Drain and Site Utility Profiles shall include, but not be limited to inverts, rim elevations, existing and proposed grade, flow-line gradients, pipe size and type, and all proposed utility crossings as shown on site utility plans.

12.4 CRITICAL PATH METHOD (CPM) SCHEDULE

A. A CPM Schedule is Required on all construction projects unless the dollar value and nature of work clearly demonstrate no need for a CPM schedule.

B. During This Phase, the A/E Shall identify significant milestones required for control and phasing of the project.

C. These Milestones will be used in the Construction Phase to evaluate the Contractor's proposed CPM schedule.

12.5 CONSTRUCTION INSPECTION AND TESTING SERVICES (CITS)

A. CITS Contracts: For projects on which special construction inspection or quality assurance testing is to be provided by private construction inspection and testing firms (CITF), the required material inspection and testing requirements shall be part of the construction documents.

B. The A/E Shall Assist the OFP in the Definition of These Services; and after award of the contract shall, on behalf of the OFP, monitor the work of both the testing laboratory employed by the contractor and the CITF.

C. CITS Proposal Package

- (1)** With the 50% CD submission, the A/E shall include a CITS specification/proposal package indicating those contract items requiring materials inspection and testing and the estimated quantity of each.
- (2)** These documents shall be developed based upon a format provided by the OFP.
- (3)** CITS specifications shall include and establish the requirements relative to inspection and testing:
 - (a)** qualifications of the inspectors
 - (b)** scope of work
 - (c)** applicable standard test methods and procedures

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- (d) compliance and acceptance criteria
- (e) reports and submissions
- (4) CITS may include inspection of
 - (a) structural steel (both shop and field)
 - (b) welding
 - (c) concrete
 - (d) roofing and roofing materials
 - (e) asphalt
 - (f) soils
 - (g) foundations
 - (h) mechanical systems
 - (i) electrical systems

NOTE: The CITS testing requirements shall be comparable to the testing requirements included in the specifications for the contractor's testing laboratory.

D. CITS: The OFP will use information furnished by the A/E to procure the services of a CITS by advertising and soliciting proposals from at least three qualified firms, or by using a pre-approved indefinite quantity contract (IQC).

E. Contract Monitoring assistance by the A/E may involve reviewing test results and field inspection reports submitted by the CITS

12.6 FINAL CD REVIEW SUBMISSION: (95% COMPLETION) When CD's are 95% completed the A/E is required to submit the following to the OFP PM:

NOTE: Review sets shall be marked "FOR REVIEW ONLY, NOT FOR CONSTRUCTION"

- A. 95% Complete Drawings:** black or blue-line prints
- B. Specifications:** indexed and securely bound.
- C. Structural, Mechanical and Electrical Calculations**
 - (1) Two bound copies of each set of calculations shall be submitted.
 - (2) Calculation books shall be signed by the designer and the person who checked the calculations.
 - (3) The final structural calculations shall include all loading assumptions, material grades and strengths,

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code references, and any other information required for design.

D. Electrical Coordination Study (minimum requirements)

- (1) Encompasses that segment of the distribution system between the origin of utility service and the first level of secondary distribution equipment.

NOTE: If service is derived from an existing state-owned distribution system, use the segment between the existing primary distribution equipment and the first level of secondary distribution equipment.

- (2) The study shall include set points for all adjustable protective devices.

E. Sediment and Erosion Control and Stormwater Management updated computations.

F. "Marked-up" 50% CD Review Documents.

G. MDE APPROVAL: In accordance with Chapter III, Paragraph 1.9 of this manual, approval of the Sediment and Erosion Control and Stormwater Management Plans by the Maryland Department of the Environment and a copy of the MDE approval or comment letter is required to complete this review phase.

12.7 THE COST ESTIMATE WORKSHEET and a detailed breakdown of costs in CSI format with a summary of the 16 Divisions shall be submitted within two weeks of the 95% CD submission. 4 copies are required.

12.8 FINAL REVIEW MEETING

A. When the 95% CDs Have Been Reviewed by DGS, the OFP PM will schedule a mandatory meeting with all concerned OFP staff, the A/E and Consultants, and the UA.

B. At This Meeting the CDs will be reviewed in detail to assure the OFP and the UA that all coordination issues and design related comments will be corrected on the Final CDs.

12.9 ALL NECESSARY PERMITS AND APPROVALS to make connections to existing electric, gas, water and sewer utilities needed to support the project as called for in (Division III, paragraph 1.4) shall be obtained or in the final stages of processing at the time 95% CD's are submitted.

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12.10 FINAL CD SUBMISSION (100% COMPLETION): The A/E shall submit the following to the OFP:

- A. "Marked-up" 95% CD Review Drawings, Specifications, Proposal Forms, Etc.**
- B. 100% Complete Contract Drawings** - Reproducible Mylar Film Tracings and CADD compact disk with files in tif format.
- C. Camera Ready Copy of Specifications and Compact Disk** with files in pdf format.

12.11 FINAL APPROVALS

- A. The A/E Shall Submit to the OFP PM Final Approvals and Permits** from all regulatory agencies and public utilities involved in the project construction, e.g.
 - (1) State Fire Marshal's Office
 - (2) Department of Health and Mental Hygiene
 - (3) Maryland Department of the Environment
 - (4) water, sewer, telephone, gas and electric utilities owners

12.12 A/E CERTIFICATION: The A/E will furnish the certification of the CD's as required in Division I, paragraph 9.

12.13 CONSTRUCTION BID FORM INFORMATION

- A. Bid Items:** Language shall be proposed to describe the base bid line item(s) and any alternate(s) to be included in the total bid.
- B. Time of Completion:** A/E shall recommend a construction duration to the OFP PM based on such factors as complexity of the project, long-lead time materials, time of year construction will start, etc.
- C. Unit Prices**
 - (1) When separate prices or unit prices are required, they shall be listed ahead of the Base Bid line.
 - (2) Unit prices will reflect concealed conditions encountered during a project, e.g. conditions in site work such as unsuitable soil, abandoned foundations or other unknown subsurface obstructions, reroofing, etc. and will be used to

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adjust the contract price higher or lower based upon actual costs during the course of work.

- (3)** When bidding these types of projects, base bid shall include
 - (a)** lump sum price work plus unit price work with estimated quantities established by the A/E
 - (b)** and unit prices provided by the contractor to arrive at the base bid.

12.14 ALTERNATES

A. When Authorized by the OFP PM, the A/E shall develop alternates to be excluded from the base contract work when considered necessary to assure project costs remain within established budgets. Alternates shall not exclude key elements of the project program or be used to affect a change in the scope of the project or in the materials or methods specified.

B. The Following Practices Shall be Followed by the A/E when specifying alternates:

- (1) Priorities:** The A/E shall review all alternates with the OFP PM, Design Team Leader, and the UA representative to establish the priority in which alternates will be listed. Add alternates, if accepted with the Base Bid, will be accepted in the order listed on the bid form. Alternates shall normally be all additive in a given bid.
- (2) Federal Requirements:** If any part of the project is federally funded, Federal Government requirements for Alternates shall be followed.

12.15 QUALITY CONTROL (QC) & QUALITY ASSURANCE (QA)

A. The A/E Team Shall Submit a single set of final (100%) project documents indicating that a senior staff member of the prime firm and each consultant firm, responsible for QC/QA, has reviewed the documents for conformance with the program, applicable building codes, and coordination issues with other disciplines. QC/QA reviewers shall be licensed architects or engineers with at least ten years of experience.

B. QC/QA Drawings Shall be Signed by Each QC/QA Reviewer certifying that the review was conducted by that person.

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13 PHASE IV - BIDDING PROCEDURES

13.1 INVITATIONS: The OFP will invite contractors who are likely to be interested. The A/E is requested to suggest additional qualified contractors.

13.2 ADVERTISEMENT: The DGS Procurement Division will post the project notice on the e-Maryland Marketplace electronic procurement website, and will notify the Maryland Contract Weekly and building-trade organizations of the request for bids. It will distribute bid documents to appropriate trade organizations.

13.3 BID DATE: The OFP will determine the time and date for receipt of bids after contract documents are delivered to the OFP, or after a fixed delivery time and date are determined.

13.4 DISTRIBUTION OF CONTRACT DOCUMENTS: The DGS Procurement Division distributes contract documents to contractors, sub-contractors and suppliers on a non-refundable deposit basis.

13.5 PRE-BID CONFERENCE: A pre-bid/pre-proposal conference will be conducted seven (7) days after the project is first advertised. The conference will be attended by the OFP PM, the DGS Procurement Officer, the UA representative, the A/E, and all interested prospective bidders.

A. The Procurement Officer (PO) will co-chair the meeting with the OFP PM. The PO will open the meeting and provide a complete description of the project and the procurement issues regarding the project source selection and bid process, including the MBE program requirements.

B. The OFP PM will discuss the general scope of the project work, the construction documents, and the General Conditions.

C. The A/E will explain the technical requirements and receive and respond to technical questions.

D. The Meeting is intended to encourage an interchange of questions, answers and ideas so as to minimize problems during the procurement process and subsequent construction.

E. Prior to Adjourning the Pre-Bid Conference, the PO and OFP PM will establish a cut off date for receipt of all questions. This is typically set eight (8) days prior to the scheduled bid opening.

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F. The A/E Shall Record and Write Minutes of the conference and incorporate issues addressed at the pre-bid conference into Amendment #1 to the bid documents. This amendment shall be issued quickly so the pre-bid attendees and non-attendees are equally aware of the cut-off date and deadline.

G. The PO will be responsible for receiving, routing and tracking all written questions during the 21 day bidding cycle (advertisement to bid opening). The PM, A/E or UA Representative shall record and refer all questions received verbally to the PO in writing.

13.6 AMENDMENTS

A. Interpretation: All interpretations of the bid documents shall be issued by the PO during the bidding period. Any verbal interpretation or oral pre-bid statements by State employees or their representatives shall not be binding on the State. Interpretations shall be given by written instruction only and forwarded to all bidders or persons known to have obtained the bid documents.

B. Preparation: The A/E shall prepare all written amendments to the bid documents and deliver same to the OFP PM and the PO in electronic format and/or hard copy, as agreed to in advance by the OFP PM.

- (1) **Form:** Each Amendment to an ITB shall be in simple written form with a cover page prepared to identify the project receiving the Amendment. In responding to bidder questions, the A/E shall first identify the question, the Specification Section affected and then insert the A/E's response directly beneath the question in **bold letters and in sentence form**.
- (2) **Changes to the Bid Documents:** All additions or deletions to the Bid documents, specifications, drawings, sketches or attachments shall first identify the Division, Section, paragraph, subparagraphs or page numbers being changed, followed by **the amended text in bold type**.
- (3) If, in the opinion of the Assistant Secretary of the OFP, the number of changes or clarifications necessary are of such an amount that special measures are necessary to eliminate any confusion, the A/E shall be directed, at no additional cost, to prepare a set of conformed documents:

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- (a) To incorporate all changes or clarification into the drawings and furnish replacement tracings and compact disks.
- (b) To incorporate all changes or clarifications into the specifications and either furnish copies of replacement sections or the entire specification and a compact disk with the entire specification.
- (c) To ensure that changes or clarifications to either the plans or the specifications are readily identified by noting "Revised by Amendment # " and by clouding and numbering the revision.

C. After an Amendment Has Been Prepared by the A/E and forwarded to the OFP PM and the PO, the PO will distribute all amendment documents to the prospective bidders within a reasonable amount of time, which is generally (7) days prior to the scheduled opening of bids. In the event that this time line cannot be maintained, bid due dates will need to be adjusted to allow for the necessary review and processing time by the prospective bidders.

13.7 BID OPENING

A. Bids Are Publicly Opened in the DGS Procurement Division Bid Room beginning promptly at the designated time. DGS will notify the A/E and the UA of the time and date of bid opening. The A/E shall be present.

B. The A/E Will Be Provided Copies of the Bids after the bid opening, and shall evaluate the low bid, the low bidder's qualifications, and make a written recommendation for award to the OFP. Concurrently, the UA will forward their recommendations to the OFP in writing.

C. If the Low Bid Is 10% Higher or Lower than the A/E's Estimate, the A/E is required to submit to the OFP an analysis identifying reasons for the variance. The A/E will review unit prices for reasonableness.

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14 PHASE V - CONSTRUCTION

14.1 CONTRACT AWARD: After the determination of the apparent low bidder, the OFP PM will pursue approval of a contract by the Department Procurement Review Board (DPRB) or the Board of Public Works (BPW). After approval, DGS will execute a contract with the successful bidder.

14.2 PRE-CONSTRUCTION CONFERENCE: Within ten (10) days after approval of award, a work initiation conference will be scheduled by the Construction Division of the OFP. The contractor, the OFP PM, the UA representative, the A/E, the OFP Construction Division Area Supervisor and Resident Inspector for the project, and the MDE representative will be present. At this time all procedures will be clarified. The OFP Area Supervisor will define the construction set of contract documents as the bid set with addenda and state the dates of each.

NOTE: The A/E is responsible for preparing and maintaining minutes of this conference.

14.3 PROJECT SIGNS: Project signs are required for all projects over \$50,000 and six (6) months duration. The State will provide one project sign for each major entrance to the project. Project signs will comply with the requirements of General Conditions clause 7.02.

14.4 PROGRESS MEETING AND PROJECT REPORT

A. Responsibilities

- (1) The A/E shall attend all progress meetings, and is responsible for recording and maintaining minutes.

NOTE: The A/E shall submit minutes for approval to the OFP PM and Resident Inspector within five working days following progress meetings.

- (2) The OFP Resident Inspector is responsible to ensure that appropriate information is included in the minutes and that the minutes are in the standardized format.

B. Scheduling: Progress meetings will be held biweekly unless otherwise specified by DGS, OFP. The purpose of the progress meeting is to review the job progress and resolve problems that may be impeding progress. Problems strictly between the Contractor and the Sub-Contractor shall not be discussed. At each meeting, actual job progress and

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anticipated work as outlined in the project schedule will be reviewed. The following documents will also be reviewed:

- (1) PCO Log (Inspector maintains)
- (2) Submittal Log (A/E maintains)
- (3) RFI Log (A/E maintains)
- (4) Testing Log (Contractor or CITF maintains)

C. Requirements: At all required meetings during the construction phase, the A/E is required to bring members of the design team whose technical expertise is necessary to clarify or reconcile project difficulties. Those personnel are required to furnish to the OFP written reports summarizing clarification, direction, reconciliation or results of field inspections.

NOTE: The A/E shall include sufficient man-hours of the various disciplines in construction phase services to provide this support on an "on-call/as-needed" basis. No additional compensation shall be made to the A/E over and above the amounts included in the A/E fee unless the requirement arises for services outside the original contract scope.

D. Minutes: The progress meeting minutes are to contain the following information. Items (1) through (7) shall be on the first page of minutes.

- (1) Project Name
- (2) Project Number
- (3) Progress Meeting Number
- (4) Time and Date of Meeting
- (5) Project Synopsis:
 - (a) Notice to Proceed
 - (b) Completion Date
 - (c) Contract Calendar Days (Original)
 - (d) Revised Contract Calendar Days (including approved time extensions)
 - (e) Contract Calendar Days Elapsed
 - (f) Contract Calendar Days Remaining
 - (g) Percentage of Time Consumed
 - (h) Percentage of Job Completion
 - (i) Anticipated Completion Date
 - (j) Bad Weather Days Requested
- (6) Statement of Any Items with the Potential for Delaying the Project
- (7) Summary of Work Completed to Date - Review/Update Project Schedule

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- (8) Old Business - Issues Resolved
- (9) New Business - Projected Dates to Resolve New Issues
- (10) Review PCO Log
- (11) Review Submittal Log
- (12) Review RFI Log
- (13) Review Testing Log
- (14) Review Status of Field Mark-up Record Drawings
- (15) Participants
- (16) Time and Date of Next Progress Meeting
- (17) Time of Adjournment

14.5 MATERIALS AND COLORS: In the early stage of construction, the A/E shall, on receipt of samples and material submissions from the Contractor, select and coordinate the approval of brick panels, stone samples, concrete colors and textures, paint colors, and all other finishes with the OFP PM and the UA Representative. The OFP must also approve any material substitutions.

14.6 SHOP DRAWING REVIEW

A. The A/E Shall Review and Approve shop drawings, samples and other submissions by the Contractor for conformance with the general design concept of the project and for compliance with the information given in the Contract Documents.

B. Reviews Shall Be Accomplished within fourteen (14) calendar days of receiving the submission from the Contractor.

C. The A/E Shall Compile a complete set of approved shop drawings, samples and other submissions from the Contractor throughout the duration of the project. Shop drawings shall be catalogued and filed by specification section reference. The entire catalogued file of shop drawings shall be turned over to the Using Agency when substantial completion is granted to the Contractor.

14.7 REQUEST FOR INFORMATION (RFI)

A. The Contractor will periodically issue RFI's for clarification of design intent or construction detailing not readily apparent from the Contract Documents.

B. The A/E Shall Review and Respond in writing to RFI's within fourteen (14) calendar days of receipt from the Contractor.

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14.8 PROPOSED CHANGE ORDERS (PCO) AND CHANGE ORDERS (CO)

A. Requirements: The Contractor will forward PCO's to the A/E to review and recommend approval or revision for all construction related change orders. The PCO should include a detailed cost proposal with an itemized breakdown showing all related material quantities, labor hours, material costs, unit prices, wage rates, labor and material burdens, and other associated expenses.

- (1) The A/E is responsible to review the Contractor's cost proposal and verify that it is fair, reasonable, and accurately reflects the proposed changes.
- (2) If the A/E finds that the Contractor's cost proposal does not accurately reflect the proposed changes, suggested revisions shall be clearly and legibly marked on the cost proposal, or a separate estimate shall be prepared itemizing revised quantities and/or costs. For complex PCO's, the A/E's estimate shall be prepared by the cost estimating consultant on the A/E team.
- (3) The A/E is also responsible for the preparation and transmittal to the OFP Construction Division of PCO approval forms.

B. Unauthorized Changes: UA representatives are not authorized to issue instructions of any kind to contractors or A/E's except when such instructions relate to security or operating functions of a correctional institution.

C. Procedure: Changes requested by the UA must be submitted in writing to the OFP PM. These will be reviewed with the OFP Design Team and Construction Division, who will issue the necessary instructions to the contractor and/or the A/E.

D. Construction Change Order Approval Form: This form will note the reason for the change order. The change order may be required due to a user request for program change, field condition, design omission, or design error.

- (1) The OFP may seek to recover all costs due to a change order that results from an error in the preparation of the documents.
- (2) The OFP may seek to recover a portion of the costs due to an omission in the documents which causes the State to incur a cost it would not have incurred had the documents been correct at bidding.

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E. Deletions and Revisions: If a change order involves construction work deleted from the project or substantially revised during the Construction Phase, and the deletion or revision requires the A/E to render professional services beyond the negotiated Construction Phase services, additional compensation may be requested during the change order approval process. Additional fees applicable to such a change order shall be noted in the space provided on the Change Order Approval Form, and appropriate supporting documentation shall be provided. The request will be considered by the OFP along with the approval review of the change order. If an additional fee related to a construction change order is approved, the A/E shall include the amount on their invoice form as "Additional Fee for CO.#____", to be processed with their next payment request.

14.9 CERTIFICATES OF PAYMENTS

A. Percentage of Completion: The general contractor's representative, the OFP Resident Inspector and the A/E will agree in draft form on the percentages of completion of the various segments of construction derived from an updated CPM schedule. The representative sub-contractors will participate in this effort as deemed necessary by the general contractor and the OFP Resident Inspector.

B. Monthly Estimate: After agreeing on the percentages of completion, the general contractor will prepare a typed copy of the prescribed payment requisition form and return it to the OFP Resident Inspector for signature.

C. Review: When the monthly payment requisition is completed the contractor will be responsible for submitting the document to the A/E for review and signature.

D. Submission: After the A/E has reviewed and approved the monthly payment requisition, the contractor shall deliver it to the OFP Resident Inspector, who will forward it through the OFP regional office and headquarters to the DGS Accounting Department.

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15 COMPLETION AND ACCEPTANCE OF PROJECT

15.1 SUBSTANTIAL COMPLETION

NOTE: Substantial Completion is the date on which the project can be occupied and used for its intended purpose.

A. When a Project, or a Designated Portion Thereof, Nears Substantial Completion, the inspector will schedule a work list inspection. The Architect, appropriate Design Consultants (i.e. Civil, Mechanical, Electrical, Landscape, Security, etc.) the UA, and the Contractor will participate.

NOTE: For projects accepted in phases the acceptance sequence, e.g. work list inspection, substantial completion inspection, etc., will be repeated for each phase.

B. Work List: As the project approaches substantial completion, a work list will be generated by the Contractor for each category of work (i.e. Architectural, Civil, Mechanical, Electrical, Landscape, Security, etc.). Each work list will identify work not yet completed, work not yet started, and items requiring repairs or adjustment.

C. Substantial Completion Inspection: When the number of items remaining on the work list is insignificant, and none of the items remaining would prevent the intended use of the Facility or would inconvenience the UA if accomplished after occupancy, OFP will schedule a substantial completion inspection, which will include representatives from the A/E team. The entire project will be inspected and all defects or deficiencies observed in the construction or any deviations from the contract documents will be noted on the punch list.

15.2 ACCEPTANCE: If, in the opinion of the OFP, the project is ready for acceptance, a substantial completion inspection report will be issued to the Contractor establishing the date of acceptance and the start of the warranty period. All representatives sign the substantial completion inspection report.

15.3 RECORD DOCUMENTS

A. As-Built Drawings

- (1) Field mark-up record drawings shall be marked up by the Contractor on a regular basis during construction to record all changes in the work as they occur. The status of these field mark-up drawings shall be discussed in each progress meeting. The mark-up information will show the

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exact location of all exposed and concealed pipe runs, valves, plugged outlets, clean outs, and other control points including electrical conduits and ducts, and will incorporate all changes to the original bid documents authorized through approved change orders to the contract in such manner as will provide a complete, accurate as-built record. The location of pipes or control points concealed underground, under concrete, in chases or above hung ceilings shall be dimensioned. Field mark-up record drawings shall be neatly marked with colored pencil or ink. Delivery of the field mark-up record drawings to DGS is a condition for final payment to the Contractor.

- (2) The Contractor shall submit the field mark-up record set of drawings to the inspector. If acceptable, the drawings will be forwarded to the OFP PM who in turn will forward them to the A/E. The A/E shall review the record set of drawings and incorporate the As-Built information on the original CADD contract drawing files.
- (3) As-Built drawings must be corrected original CADD files submitted on a compact disk. A second compact disk shall be provided to DGS with the drawing files in tif format.
- (4) Acceptance of As-Built drawings shall be conditional upon OFP approval of materials, quality, completeness and accuracy. The OFP reserves the right to verify As-Built accuracy prior to final payment.
- (5) As-built drawings on Capital Projects shall be turned over to the OFP within two months and on other projects within one month after satisfactory completion of the project. Final payment of the A/E's Phase V fee shall not be made until As-Built drawings and one complete set of contractor's field record set are submitted to the OFP.

B. Guarantees, Warranties, etc.: The A/E shall obtain from the Contractor all Guarantees, Roof Warranty, Equipment and Maintenance Manuals, Brochures, etc., and forward same to the UA with copy of transmittal letter to the OFP PM.

C. Approved Shop Drawings: Throughout the Construction Phase, the A/E shall assemble a complete set of approved shop drawings for the UA. At the time of acceptance of the project the A/E shall forward this complete set of approved shop drawings directly to the UA. The A/E shall obtain a written receipt signed by the UA and forward it to the OFP PM.

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16 PHASE VI - POST CONSTRUCTION PHASE (CONTRACTOR'S GUARANTEE PERIOD)

16.1 SITE VISITS: During the two year guarantee period, unless otherwise authorized by the OFP PM, the A/E and his design team shall participate in warranty inspections at 6, 12 and 23 months after acceptance of the project. These visits will be arranged by the OFP Construction Division and shall be in the presence of the UA representative and the OFP Construction Inspector.

16.2 REPORTS: The OFP Construction Inspector will file the DGS Warranty Inspection Report (see Attachment 14 of this Manual) which will list contractual guarantee items, maintenance items and design complaints. In the case of serious design or construction deficiencies, a supplemental written report will be made by the A/E indicating results of visits and will be submitted to the OFP PM.

TABLE II-1
BASIC SUBMISSION REQUIREMENTS FOR DESIGN PHASES

<u>SCHEMATIC PHASE</u>	<u>DD PHASE</u>	<u>CD PHASE</u>
Cover Sheet (paragraph 7.2 and Attachment 11)	Cover Sheet (paragraph 7.2 and Attachment 11)	Cover Sheet (paragraph 7.2 and Attachment 11)
Transmittal Letter	Transmittal Letter	Transmittal Letter
Project Description Sheet (3 copies, Attachment #6)	Project Description Sheet (3 copies, Attachment #6)	Project Description Sheet (4 copies, Attachment #6)
Monthly Progress Report (3 copies, Attachment #5 & paragraph 2.1)	Monthly Progress Report (3 copies, Attachment #5)	Monthly Progress Report (3 copies, Attachment #5)
Cost Estimate (3 copies in CSI format w/ Summary of the 16 Divisions - Attachment # 3 & 3a)	Updated Cost Estimate (3 copies in CSI format w/ Summary of the 16 Divisions - Attachment # 3 & 3a_)	Updated Cost Estimate (4 copies in CSI format w/ Summary of the 16 Divisions - Attachment # 3 & 3a)
Areas-Volume-Efficiency Summary (3 copies-Attachment #4)	Areas-Volume-Efficiency Summary (3 copies-Attachment #4)	Areas-Volume-Efficiency Summary (4 copies-Attachment #4)
Building Code Design Data (3 copies-Attachment #10)	Building Code Design Data (3 copies-Attachment #10)	Building Code Design Data (3 copies-Attachment #10)
Schematic Design Drawings	Design Development Drawings	CD drawings appropriate for phase
Narrative Description (3 copies-Architectural & site improvements, and engineering analysis of structural, mechanical, electrical & civil systems)	Transmittal letter from MDE w/ signatures stating that the project was submitted for review (required for projects involving site work or hazardous/toxic waste)	Transmittal letter from MDE w/ signatures stating that the project was submitted for review (required for projects involving site & utility work)
Forest Delineation Plan (paragraph 5)	Outline Specifications (paragraph 11.8)	Specifications (indexed & securely bound w/ durable covers)
Value Engineering (Chapter I, paragraph 7)	"Marked-up" Schematic Review documents	"Marked-up" DD Review documents
Site Plan (paragraph 7.3 C)	Preliminary SEC/SWM plans & computations	SEC/SWM Plan, specs, and computations

TABLE II-1
BASIC SUBMISSION REQUIREMENTS FOR DESIGN PHASES

<u>SCHEMATIC PHASE</u>	<u>DD PHASE</u>	<u>CD PHASE</u>
Sub-Surface Exploratory Program Submit 3 copies on <u>completion</u> of Schematics	Preliminary Electrical & Mechanical Calculations (paragraphs 11.9 & 11.10)	Structural, Electrical & Mechanical Calculations (paragraphs 12.2 A, B & C)
Sediment & Erosion Control and Stormwater Management Program (Appendix B)	Life Cycle Cost/Energy Conservation Analysis (3 copies) (paragraph 11.11 & Chapters 5 & 6)	CITS specification/bid package (paragraph 12.5)
	Building Code Analysis & Egress Plan (paragraph 11.1)	Building Code Analysis & Egress Plan (paragraph 11.1)
	Completed Geotechnical Report (Appendix A)	Site Improvement Drawings (paragraph 12.3)
	Site Plan (paragraph 7.3 C)	MDE approval - Sediment & Erosion Control and SWM (paragraph 12.6 G)
	Value Engineering (Chapter I, paragraph 7)	Sediment & Erosion Control and Stormwater Management Program (Appendix B)
	Sediment & Erosion Control and Stormwater Management Program (Appendix B)	

CHAPTER III

TITLE: CODES and REGULATIONS	Revised: July 2003
Responsible Organization: Office of Facilities Planning	
Instructions: This procedure supersedes the DGS Procedure Manual for Professional Services, dated July 1998. Please recycle the superseded document.	

1 CODES and REGULATIONS

1.1 BUILDING CODE: The building code of the State of Maryland consists of the latest editions of the International Building Code (IBC) for Basic Building, Mechanical, and Energy Conservation Codes, National Electrical Code, and ASHRAE standards. All Appendices, References, and Additions must be incorporated.

1.2 BUILDING PLUMBING SYSTEMS shall comply with COMAR 09.20.01, which references the National Plumbing Code 2000.

1.3 BUILDING HEATING SYSTEMS utilizing boiler supplied hot water shall comply with the requirements of COMAR 09.12.01 and the State Boiler Code.

1.4 ELECTRIC, GAS, WATER, SEWERAGE, TELECOMMUNICATION, and DATA work when required shall comply with all regulations and requirements of local and service district utility companies.

1.5 FIRE CODE for the State is The State Fire Prevention Code, COMAR 29.06.01. The Code references the latest edition of the NFPA National Fire Codes including Standards and Recommended Practices Manuals.

1.6 SPRINKLER SYSTEMS installed in new construction projects shall be in accordance with Article 38A, Section 12B of the Annotated Code of Maryland.

1.7 ELEVATORS, ESCALATORS, DUMBWAITERS, MOVING WALKS etc. are governed by ANSI A17.1 or the latest edition, and other requirements of the State Department of Labor, Licensing and Regulation (DLLR), Division of Labor and Industry (COMAR 09.12.81 through 09.12.83)

1.8 HANDICAPPED ACCESSIBILITY requirements are governed by The Maryland Accessibility Code (COMAR 05.02.02), The Fair Housing Amendments Act (1988), The Americans with Disabilities Act (ADA)

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(1990), and other applicable Federal laws and regulations.

1.9 SEDIMENT and EROSION CONTROL and STORMWATER MANAGEMENT shall comply with regulations of the Maryland Department of the Environment (MDE), Water Management Administration, Environment Article sections 4-101 through 4-116, Annotated Code of Maryland and COMAR 26.17.01 and 26.17.02. When applicable, work in Nontidal Wetlands areas shall comply with COMAR 26.23, and work in Wetlands areas shall comply with COMAR 26.24. Additional requirements are given in Appendix B of this Manual.

1.10 CHESAPEAKE BAY CRITICAL AREA criteria and compliance requirements are regulated under the provisions of COMAR Title 27. Additional requirements are given in Chapter II, paragraph 6 of this Manual.

1.11 FOREST CONSERVATION AND REFORESTATION REQUIREMENTS are regulated under the provisions of Maryland Department of Natural Resources Article of the Annotated Code of Maryland, Sections 5-103, 5-501 through 5-509, and 5-1601 through 5-1613. Regulations for development of Forest Stand Delineation and Forest Conservation Plan are also included in COMAR 08.19.04. Additional requirements are given in Chapter II, paragraph 5 of this Manual.

1.12 FLOOD PLAIN MANAGEMENT is regulated under the provisions of COMAR 26.17.04. Additional requirements are given in Appendix C of this Manual.

1.13 OTHER WATER RESOURCES are regulated under the provisions of rules and procedures issued by the MDE and COMAR 26.08

1.14 WATER AND SANITARY SYSTEMS

A. Surface and Groundwater Treatment Plants, Wastewater Treatment Plants Discharging to the Waters of the State, and Connections in Excess of 400 Linear Feet to Municipal Water or Sewer Systems are governed under MDE Regulations in COMAR 26.03 and 26.04. The A/E shall obtain a Water & Sewerage Construction Permit from the Applications & Permits Section, Water Management Administration, Department of the Environment.

B. On-site Wastewater Collection and On-site Wastewater Treatment with Underground Effluent Disposal are regulated by

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the Health Department or other designated agency of the local jurisdiction. The A/E shall ensure compliance with all jurisdictional regulations and criteria, and shall obtain all required permits and/or written approvals.

C. WATER APPROPRIATION: When the project requires the withdrawal of either groundwater or surface water, the A/E shall comply with all permitting requirements and COMAR 26.17.06, Water Appropriation or Use.

1.15 SWIMMING POOLS are regulated under the provisions of COMAR 10.17.01, Public Swimming Pools and Spas.

1.16 HOSPITALS: Hospitals are regulated in accordance with Maryland Department of Health & Mental Hygiene (DHMH) regulations for hospitals, care and treatment facilities (COMAR 10.07).

NOTE: OFP will provide the appropriate regulations to the A/E.

1.17 FOOD PREPARATION: Maryland DHMH Regulations for food service facilities (COMAR 10.15.03) applies when food preparation or serving areas are included in the project.

1.18 LEAD EXPOSURE is governed by Maryland Occupational and Health regulations for occupational exposure to lead in construction work. (COMAR 09.12.32)

1.19 HAZARDOUS WASTE is governed by MDE Standards for controlled hazardous substances. (COMAR 26.13.03)

1.20 HISTORIC LANDS AND STRUCTURES are governed in accordance with Article 83B, Sections 5-617 and 5-618 of the Annotated Code of Maryland. Early in the planning stages of a project, the Maryland Historical Trust shall review capital projects affecting historic properties.

A. For Projects Located in Baltimore City Involving Historic Structures, the Design Advisory Panel (DAP) shall also be invited to review project documents.

B. Based on an Initial Assessment by the Maryland Historical Trust, a Phase I Archaeological Survey may be required.

C. Findings During a Phase I Investigation may require a Phase II Archaeological Investigation.

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1.21 HIGHWAYS are regulated by the Maryland Department of Transportation (MDOT), State Highway Administration (SHA), for any construction affecting a State Highway route or right-of-way, or local jurisdictions where projects are accessed by their roadways.

CHAPTER IV

TITLE: POLICIES and STANDARDS	Revised: July 2003
Responsible Organization: Office of Facilities Planning	
Instructions: This procedure supersedes the DGS Procedure Manual for Professional Services, dated July 1998. Please recycle the superseded document.	

1 COMPUTER AIDED DRAFTING and DESIGN (CADD)

1.1 DRAFTING CONVENTIONS AND LAYERING SYSTEMS SHALL

A. Conform to the American Institute of Architects (AIA) standard layering system, latest edition, and national CADD standards.

B. Conform to the Construction Specification Institute (CSI) Drafting Standards, latest edition drafting format for both graphic and textural information used within drawings e.g. reference template, line, identity and material symbols.

C. Exhibit a Layer Index describing the layer name and layer contents e.g. Layer 1: Existing walls to remain, etc.

1.2 THE PROJECT MANUAL AND DRAWINGS shall be delivered on electronic media (compact disk) in addition to hard copies.

NOTE: 1.1 C. and 1.2 apply to all disciplines.

2 DRAFTING STANDARDS

2.1 ARCHITECTURAL SYMBOLS AND ABBREVIATIONS shall conform to The Architectural Graphic Standards, latest edition.

2.2 LANDSCAPE SYMBOLS AND ABBREVIATIONS shall conform to The Architectural Graphic Standards, latest edition.

2.3 HVAC ENGINEERING SYMBOLS AND ABBREVIATIONS shall conform to The ASHRAE Fundamentals Handbook, latest edition.

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2.4 PLUMBING ENGINEERING SYMBOLS AND ABBREVIATIONS shall conform to The ASPE Data Book, latest edition.

2.5 FIRE PROTECTION ENGINEERING SYMBOLS AND ABBREVIATIONS shall conform to The NFPA National Fire Codes, latest edition.

2.6 ELECTRICAL ENGINEERING SYMBOLS AND ABBREVIATIONS shall conform to the latest NFPA, NEC, IEEE and IES standards.

2.7 STRUCTURAL ENGINEERING SYMBOLS AND ABBREVIATIONS shall conform to the latest AISC, ACI, and AITC standards.

2.8 CIVIL ENGINEERING SYMBOLS AND ABBREVIATIONS shall conform to the latest editions of the MDOT Standard Specifications for Construction Material, MDE Standards and Specifications for Soil Erosion and Sediment Control, and the DNR Forestry, Waterways, and Wetlands publications.

3 LIQUIDATED DAMAGES

3.1 THE FOLLOWING LIST SUGGESTS MINIMUM AMOUNT GUIDELINES FOR DETERMINING LIQUIDATED DAMAGES:

<u>ESTIMATED PROJECT COST</u>	<u>CLASS</u>	<u>LIQUIDATED DAMAGES per DAY</u>
Under \$25,000.00		\$100.00
\$25,000. to \$100,000.	A	\$250.00
\$100,000. to \$500,000.	B	\$350.00
\$500,000. to \$1,000,000.	C	\$550.00
\$1,000,000. to \$2,500,000.	D	\$750.00
\$2,500,000. to \$5,000,000.	E	\$1,000.00
\$5,000,000. to \$10,000,000.	F	\$1,500.00
\$10,000,000. to \$15,000,000.	G	\$2,000.00
More than \$15,000,000.	H	\$2,500.00

CHAPTER IV POLICIES and STANDARDS

4 OFFICE SPACE STANDARDS (Facility Program Manual, DGS/DBM, latest edition)

OFFICE TYPE	RECOMMENDED NASF
Cabinet Secretary & Agency Executive Director	300
Deputy Secretary & Agency Deputy Director	250
Judge, Commissioner (full-time), Director, Assistant Secretary & Division Chief	200
Assistant Division Chief, Assistant Director & Branch Head	175
Attorney, Doctor & Field Office Supervisor	150
Supervisory Professional (Private Office)	126
Supervisory Professional (Open Office)	120
Non-supervisory Professional (Private Office)	108
Non-supervisory Professional (Open Office)	90
Secretaries & Drafting Stations (CADD) (Conventional Office)	90
Secretaries & Drafting Stations (CADD) (Open Office)	81
Word Processor & Clerical Stations (Conventional Office)	60
Word Processor & Clerical Stations (Open Office)	56
Conference Room	22 per person
Reception & Waiting Room (1 - 15 Persons)	15 per person
Reception & Waiting Room (over 15 Persons)	10 per person

- i* Space standards indicated above include normal furniture and equipment. Additional space may be allowed for unusual furniture and equipment requirements if justified.
- ii* Enclosed offices should be a minimum of 100 NASF regardless of classification of occupant.
- iii* Allow an additional 7 NASF per file cabinet in open office areas.

CHAPTER IV POLICIES and STANDARDS

5 BUILDING EFFICIENCY FACTORS (Facility Program Manual, DGS/DBM, latest edition)

Building Type	Efficiency Factor Range	Mid-Point
Office (Non-University)	1.35 (75%) - 1.50 (67%)	1.42 (70%)
Administration/Office (University)	1.67 (60%) - 1.82 (55%)	1.74 (57%)
Library	1.52 (66%) - 1.67 (60%)	1.60 (62%)
Classroom	1.65 (61%) - 1.85 (54%)	1.75 (57%)
Science (Undergraduate)	1.65 (61%) - 1.85 (54%)	1.75 (57%)
Science (Research)	1.72 (58%) - 1.92 (52%)	1.82 (55%)
Medical (Teaching)	1.75 (57%) - 1.95 (51%)	1.85 (54%)
Dormitory	1.33 (75%) - 1.54 (65%)	1.43 (70%)
Dining Hall (Kitchen)	1.40 (71%) - 1.60 (62%)	1.50 (67%)
Student Union	1.60 (62%) - 1.75 (57%)	1.67 (60%)
Performing Arts Fine Arts	1.75 (57%) - 1.95 (51%)	1.85 (54%)
Theater, Auditorium, Concert Hall	1.45 (69%) - 1.60 (62%)	1.52 (66%)
Gymnasium	1.40 (71%) - 1.50 (67%)	1.45 (69%)
Patient Health Facility	1.70 (59%) - 1.85 (54%)	1.77 (56%)
Armory	1.25 (80%) - 1.35 (75%)	1.30 (77%)
District Court, MSC	1.70 (59%) - 1.85 (54%)	1.77 (56%)
State Police Barrack	1.50 (67%) - 1.60 (62%)	1.55 (64%)
Detention Facility	1.70 (59%) - 1.85 (54%)	1.77 (56%)
Maintenance Shop	1.25 (80%) - 1.35 (75%)	1.30 (77%)
Garage (Vehicle Support)	1.15 (85%) - 1.25 (80%)	1.20 (83%)
Park Comfort Station, Shower Building	1.30 (77%) - 1.40 (71%)	1.35 (75%)
Visitor's Center Concession	1.40 (71%) - 1.50 (67%)	1.45 (69%)

CHAPTER IV

POLICIES and STANDARDS

6 EQUIPMENT AND MAINTENANCE MANUALS

6.1 A/E RESPONSIBILITY

A. The A/E Is Responsible for Obtaining Bound Manuals from the Contractor that are appropriate for installed equipment and required maintenance.

B. The A/E Shall Furnish Three Bound Manuals to the OFP that include:

- (1) Wiring Diagrams: Detailed wiring diagrams of all signal systems, temperature control systems, and equipment interlocks systems.
- (2) Lubrication: Lubrication type, location and schedule for each piece of equipment.
- (3) Maintenance Schedules: required maintenance data and schedules other than lubrication for each piece of equipment.
- (4) Filters: types and required maintenance for each piece of air handling equipment.
- (5) Catalog Cuts: descriptive literature of each piece of mechanical and electrical equipment, indicating model number, size and capacity, performance curves, etc., as would be applicable to adequately identify and describe the equipment involved.
- (6) Spare Parts: recommended spare parts inventory.

6.2 MANUAL ORGANIZATION

A. Manuals Shall Be Organized in Five Sections:

- (1) Elevators
- (2) Special Equipment
- (3) Plumbing
- (4) Heating, Ventilation and Air Conditioning
- (5) Electrical

CHAPTER V

Title: ENERGY CONSERVATION GUIDELINES	Revised: July 2003
Responsible Organization: Office of Facilities Planning	
Instructions: This procedure supersedes the Energy Conservation for State Buildings, dated April 1994. Please recycle the superseded document.	

1 INTRODUCTION

1.1 THE ENERGY CONSERVATION GUIDELINES FOR STATE BUILDINGS:

A. Incorporates ANSI/ASHRAE/IESNA Standard 90.1-2001 Energy Standard for Buildings Except Low-Rise Residential Buildings with minor changes.

B. Sets Minimum Performance Standards. A/E's are encouraged to exceed these minimums. Life Cycle Cost Analysis (LCCA) may be used to justify additional expenditures to derive energy savings from items such as higher efficiencies of equipment, more thermally efficient windows and increased insulation.

C. Shall Be Used In Conjunction With "The High Efficiency Green Building Program" adopted by the State of Maryland. If there is a conflict between these two documents, the more stringent requirement shall apply.

2 BUILDING ENVELOPE REQUIREMENTS

2.1 THE BUILDING ENVELOPE FOR NEW BUILDINGS AND RENOVATIONS shall comply with Section 5 of ANSI/ASHRAE/IESNA Standard 90.1-2001 except for the following:

A. Insulation: A wall of a conditioned space adjacent to an unconditioned space shall have a minimum R-13 value.

B. Fenestration: Windows shall be provided with thermal breaks in the frame and low e insulating glass.

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ENERGY CONSERVATION GUIDELINES

C. Vapor Retarders Shall:

- (1) be installed in all non-vented frame areas in ceilings, walls and floors.
- (2) have a permeability rating of 1.0 perm or less.
- (3) be installed on the side of insulation that faces toward the interior of the building.

2.2 BUILDING RENOVATIONS

A. All Renovations are required to comply with these energy conservation guidelines if possible.

NOTE: If industry standards cannot be achieved, the A/E shall provide a written explanation during the Schematic Phase or as part of the LCCA if applicable.

B. Existing Building Walls are generally not required to meet new insulation requirements.

C. Roof Replacements shall be upgraded to comply with these energy conservation guidelines if possible.

D. Replacement Windows shall comply with the requirements of these energy conservation guidelines.

2.3 THERMAL INTEGRITY AND AIRTIGHTNESS

A. All New Building and Renovation construction shall utilize thermal integrity and airtightness principals and details from the National Institute of Standards and Technology (NIST) report NISTIR 4821 - Envelope Design Guidelines for Federal Office Buildings: Thermal Integrity and Airtightness.

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ENERGY CONSERVATION GUIDELINES

3 HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

3.1 THE HVAC EQUIPMENT AND SYSTEM shall comply with Section 6 of ANSI/ASHRAE/IESNA Standard 90.1-2001 except for the following:

A. Electric Resistance Heating shall not be used as a primary heating source.

B. Institutional Kitchens shall not be comfort cooled with air conditioning.

C. Heating and Cooling Load Safety Factors:

- (1) Maximum heating load safety factor shall be 10%.
- (2) Maximum cooling load safety factor shall be 5%.

D. HVAC Equipment and Systems shall be selected based on the lowest life-cycle-cost. Refer to Chapter VI - Implementation of Life Cycle Cost Analysis of this Manual.

3.2 HVAC SYSTEM SELECTION: A minimum of four alternative HVAC systems from the following list shall be compared with the selected system offering the lowest life-cycle cost:

A. For Buildings 90,000 GSF and Larger:

- (1) Central station Air Handling Units (AHU) with Variable Frequency Drives (VFD) and Variable Air Volume (VAV) air distribution system using standard or low temperature supply air with thermal storage (ice or water), variable flow piping, and central heating/cooling plant
- (2) 4-pipe Fan Coil Unit (FCU) system, thermal storage (ice or water), and central heating/cooling plant
- (3) Packaged heat pump system
- (4) Geothermal heat pump system
- (5) Other alternatives approved by DGS

B. Buildings 89,999 GSF to 30,000 GSF:

- (1) Central station AHU with VFD and VAV air distribution system using standard or low temperature supply air with thermal storage (ice or

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ENERGY CONSERVATION GUIDELINES

- water) and central heating/cooling plant
- (2) 4-pipe FCU system, thermal storage (ice or water) and central heating/cooling plant
- (3) Geothermal heat pump system
- (4) Other alternatives approved by DGS

C. Buildings 29,999 GSF to 10,000 GSF:

- (1) Central station AHU with VFD and VAV air distribution system using standard or low temperature supply air with thermal storage (ice or water) and central heating/cooling plant
- (2) 2-pipe or 4-pipe FCU system, thermal storage (ice or water) central heating/cooling plant
- (3) Packaged terminal air conditioning units with Hydronic heat and central heating plant
- (4) Packaged heat pump system and central heating plant
- (5) Split DX cooling or heat pump systems and central heating plant
- (6) Geothermal heat pump system
- (7) Other alternatives approved by DGS

D. Buildings Less Than 10,000 GSF:

- (1) Packaged terminal air conditioning system, Hydronic heat
- (2) Packaged terminal heat pump system and central heating plant
- (3) Split system DX cooling, Hydronic heating or gas fired furnaces
- (4) Split system heat pump systems
- (5) Geothermal heat pump system
- (6) Other alternatives approved by DGS

4 ELECTRICAL POWER

4.1 THE BUILDING POWER DISTRIBUTION SYSTEM shall comply with B Section 8 of ANSI/ASHRAE/IESNA Standard 90.1-2001 except for the following:

A. Provisions for Check-Metering shall be subdivided in accordance with lighting and receptacle outlets, HVAC systems

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ENERGY CONSERVATION GUIDELINES

and equipment, and service water heating, elevators and special-occupant equipment or systems of more than 20 KW.

B. A Maximum of Ten Percent of the electrical loads on any feeder may be from another usage category.

C. Variable Frequency Drives (VFD)

- (1) VFD standard and optional features shall be tested to ANSI/UL Standard 508.
- (2) VFDs shall be Pulse Width Modulation (PWM) type.
- (3) The complete VFD, including all specified options, shall be listed by a nationally recognized testing agency e.g. as UL or ETL.

5 LIGHTING

5.1 THE LIGHTING SYSTEM AND EQUIPMENT shall comply with ANSI/ASHRAE/IESNA Standard 90.1-2001 Section 9 except for the following:

A. Lighting System Design shall be based on the latest recommended IES light levels for task and localized lighting.

B. Exterior Lighting Controls may utilize electronic time clocks or an energy management system in addition to control devices mentioned in ANSI/ASHRAE/IESNA Standard 90.1-2001 Section 9.

C. Occupancy Sensors shall be provided for spaces with more than 200 watts of lighting.

D. Ultrasonic Occupancy Sensors shall not be wall mounted.

E. Night Skylight Pollution shall be minimized by the use of shielded luminaires and by the proper aiming of adjustable luminaires.

F. Multi-switch Systems shall be converted to zone systems to minimize the number of ballasts in the system.

G. Fluorescent Light Sources shall be type T8 fluorescent lamps.

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H. Ballasts shall be energy efficient, electronic type with low harmonics.

I. High Pressure Sodium Light Sources shall be used for all exterior applications except where improved color rendition is required e.g. security areas, etc. Metal halide light sources shall be used where improved color rendition is required.

J. Incandescent Light Sources shall not be used for general lighting.

K. Existing Mercury Vapor Fixtures may be retrofitted to metal halide fixtures if fixtures are retained as part of a lighting retrofit or as part of building renovations.

L. Deep Cell Fluorescent Luminaires shall be provided where recommended by IES e.g. do not use in kitchens, storage rooms, etc.

M. 2' x 2' Fluorescent Luminaires shall not be used.

6 HVAC CONTROLS

6.1 HVAC CONTROLS AND EQUIPMENT shall comply with ANSI/ASHRAE/IESNA Standard 90.1-2001 Section 6 and Section 7 except for the following:

A. The HVAC Controls System shall maintain the set point temperature within "comfort zone" described in ANSI/ASHRAE Standard 55-1981.

B. HVAC Equipment Control Diagrams, HVAC sequence of operations and a "points list" describing HVAC control points shall be provided for all projects.

C. Time Clocks shall be electronic type with battery backup.

NOTE: Mechanical time clocks shall not be used.

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ENERGY CONSERVATION GUIDELINES

6.2 ENERGY MANAGEMENT SYSTEMS (EMS)

A. Buildings 10,000 GSF Floor Area and Greater shall utilize an EMS employing a Direct Digital Control (DDC) network capable of performing automatic temperature control and energy management tasks.

B. The DDC Network shall be locally ethernet accessible with a personal computer (PC) via direct communication ports, through telephone lines by using a modem.

NOTE: Network components may be installed as a hard-wired system.

C. Each DDC Controller shall be capable of stand-alone operation with the ability to share information through a network.

D. The EMS shall control all HVAC dampers, control valves and the temperature regulation of all terminal devices.

E. The EMS shall have "open" architecture.

F. The EMS shall have the capability to incorporate security, fire protection and similar systems.

G. The EMS shall be used to control exterior lighting.

7 ENERGY PERFORMANCE INDEX

7.1 ENERGY PERFORMANCE INDICES (EPI) are numbers used to establish budget estimates based on annual energy consumption and are expressed in energy units per conditioned square feet of floor area.

7.2 ENERGY CONSUMPTION ESTIMATES for specific projects shall be included in the Life Cycle Cost Analysis based on ANSI/ASHRAE/IESNA Standard 90.1-2001.

CHAPTER V

ENERGY CONSERVATION GUIDELINES

GLOSSARY

A/E	Architect/Engineer
AHU	Air Handling Unit
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration & Air Conditioning
DDC	Direct Digital Control
DGS	Department of General Services
EMS	Energy Management System
FCU	Fan Coil Unit
GSF	Gross Square Feet
HVAC	Heating, Ventilating and Air Conditioning
IESNA	Illuminating Engineering Society of North America
LCCA	Life Cycle Cost Analysis
NIST	National Institute of Standards and Technology
PWM	Pulse Width Modulation
VAV	Variable Air Volume
VFD	Variable Frequency Drive

CHAPTER VI

TITLE: IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS	Revised: July 2003
Responsible Organization: Office of Facilities Planning	
Instructions: This procedure supersedes the DGS Procedures for the Implementation of Life Cycle Cost Analysis and Energy Conservation, dated April 1994. Please recycle the superseded document.	

1 INTRODUCTION

1.1 LIFE CYCLE COST ANALYSIS (LCCA) is an economic analysis technique considering initial acquisition costs and the recurring cost associated with the operation, maintenance, energy use, and other costs of ownership. The objective of LCCA is to optimize the cost of ownership of a building.

2 APPLICABILITY: This procedure shall be followed by all personnel within the Office of Facilities Planning (OFP), Architectural and Engineering (A/E) firms, Using Agency Clients (UA), and Consulting Firms conducting business with the OFP.

3 POLICY: It is the policy of the State of Maryland that State owned or financed buildings shall be constructed in a manner to minimize initial costs of construction, recurring costs associated with the consumption of energy resources, and the operation and maintenance of those buildings.

3.1 The Procedures described in this document shall be utilized to analyze

A. All New Buildings 5,000 Square Feet or Greater in Area.

NOTE: At DGS discretion, projects with an area of 10,000 square feet or less may not require LCCA.

B. Additions to an Existing Building that will add ten percent or more, but not less than 5,000 square feet to the gross floor space, or where the cost exceeds \$25,000.

C. Major Renovations of an Existing Building.

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IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS

4 PROCEDURES

4.1 THROUGH THE USE OF LCCA PROCEDURES, the State shall determine

A. The System's Cost Effectiveness for new construction, where the optimum building system or component has the lowest total life cycle cost meets the requirements of the building.

B. The Cost Effectiveness of Retrofit Systems for renovation projects, where the most effective system that has the lowest total life cycle cost meets the requirements of the building.

4.2 ANALYSIS: Step-by-Step Procedure to analyze Life Cycle Cost and Energy Conservation.

A. Step One: Select a minimum of four complete alternative HVAC Systems for comparison and describe them in Section 6.1. HVAC Systems shall be selected from the following list based on the GSF (floor area) of the building:

- (1) Buildings 90,000 GSF or larger
 - (a) Low Temperature VAV with Ice Storage Air Conditioning
 - (b) 4-Pipe FCU and UV with Ice Storage Air Conditioner or Central Chiller
 - (c) VAV AHU with VFD
 - (d) Hydronic Heat Pumps with Storage Tank and Ventilator Heat Recovery
 - (e) Geothermal Heat Pump Systems with or without Ventilator Heat Recovery
 - (f) Other approved alternates
- (2) Buildings from 30,000 GSF to 90,000 GSF
 - (a) VAV AHU with VFD with Central Chiller
 - (b) 4-Pipe FCU and UV with Central Chiller
 - (c) Hydronic Heat Pumps with Storage Tank
 - (d) Geothermal Heat Pump System
 - (e) Other approved alternatives
- (3) Buildings from 10,000 GSF to 30,000 GSF
 - (a) VAV AHU with VFD with Central Chiller
 - (b) 4-Pipe FCU and UV with Central Chiller
 - (c) Packaged Terminal Units with Hydronic Heat
 - (d) DX Cooling Unit with Hydronic Heat
 - (e) Hydronic Heat Pumps with Storage Tank
 - (f) Geothermal Heat Pump Systems
 - (g) Other approved alternatives

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IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS

- (4) Buildings less than 10,000 GSF
 - (a) Packaged Terminal Units with Hydronic Heat
 - (b) DX Cooling Unit with Hydronic Heat
 - (c) Packaged Heat Pump
 - (d) Hydronic Heat Pumps with Storage Tank
 - (e) 4-Pipe FCU with Hydronic Heating/ Cooling System
 - (f) Other approved alternatives
- (5) The following HVAC system components shall be considered when appropriate:
 - (a) Absorption Chillers - steam or gas fired
 - (b) Chillers/Heaters B gas fired
 - (c) Fire - Tube Boilers
 - (d) Electric Drive Chillers
- (6) The following minimum energy conservation measures shall be analyzed for use in all mechanical systems:
 - (a) Airside economizer
 - (b) Water side economizer
 - (c) Boiler economizer

B. Step Two: Complete Design Data and Energy Cost Estimate in Section 6.2.

C. Step Three: Determine initial cost of mechanical installation. Use the worksheets in Section 6.3 for estimating this cost. A detailed cost estimate is not required. A preliminary cost estimate shall be used, assuming average capacities, boiler horse-power, CFM, cooling MBH, heating MBH, motor HP's, etc. for each category of equipment.

D. Step Four: Choose on of the approved alternate systems as the Baseline System and calculate the incremental initial cost effect of Architectural, Structural, and Electrical building components for the other three alternatives e.g. an alternative may require the addition of a mechanical room with a resulting decrease in useable floor space at a cost premium.

E. Step Five: Determine preliminary estimates of Total Annual Costs of the Mechanical System alternatives including Energy, Service, and Maintenance. Complete Section 6.5 Summary. Energy cost is based on energy unit prices and escalation rates submitted by the A/E in Section 6.2.

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IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS

Servicing equipment is specialized work completed by outside organizations.

Service work is normally performed by manufacturers' representatives of major equipment companies e.g. Carrier, Trane, Honeywell, etc. Service work is characterized by annual service contracts with outside specialists. Examples are water treatment for cooling towers, air handling units and chillers.

Routine maintenance is work to keep the equipment functioning and is normally performed by the facility's maintenance department e.g. filter replacement, lubrication, belt replacement, etc.

F. Step Six: Determine the Present Value of Total Annual Cost by multiplying the Total Cost by the Present Worth Factor from the Table in Section 7.1. The A/E shall select this factor from the Table assuming the appropriate discount and escalation rates.

G. Step Seven: Calculate the Total Life Cycle Cost by adding the initial Cost to the Present Value of Total Annual Cost. The alternative with the lowest Total Life Cycle Cost shall be the recommended system.

H. Step Eight: Complete Section 6.2 Energy Cost Estimate.

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IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS

5 FORMULA

5.1 Use the following formula for LCCA of Mechanical Systems and impact on total facility cost.

$$TLCC = I + PV (E + S + M)$$

TLCC is Total Life Cycle Cost

I is initial cost of mechanical system including incremental cost impact of architectural, structural, and electrical components.

PV is **Present Value**

E is **Annual Energy** cost

S is **Annual Service** cost for life of system

M is **Annual Maintenance (routine)** cost for life of the system

Note: For the purpose of LCCA, the A/E shall disregard salvage value and replacement cost, and assumes that equipment useful life is 20 years.

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IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS

6 FORMS

6.1 SYSTEM DESCRIPTION

PROJECT:	USING AGENCY:	DATE:
LOCATION:		

BY: (Engineer's Name and Title)

SYSTEM DESCRIPTION

BASE SYSTEM:

ALTERNATE #1:

ALTERNATE #2:

ALTERNATE #3:

ALTERNATE #4:

CHAPTER VI **IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS**

6.2 ENERGY COST ESTIMATE

ENERGY TYPE	ESTIMATED AVERAGE UNIT COST	ESCALATION RATE
Electric Energy Charge	\$ Per KWH (Winter)	
	\$ Per KWH (Summer)	
Electric Demand Charge	\$ Per KWH (Winter)	
	\$ Per KWH (Summer)	
Steam Energy Charge	\$ Per MLB (Winter)	
	\$ Per MLB (Summer)	
Steam Demand Charge	\$ Per MLB (Winter)	
	\$ Per MLB (Summer)	
Gas	\$ Per MCF or Therm	
Fuel Oil	\$ Per Gallon	
Coal	\$ Per Ton	
Others	\$ Per (unit)	
	\$ Per (unit)	

Utility Summer Rate Months: (from) (to)
Utility Winter Rate Months: (from) (to)
Useful Equipment Life 20 years
Discount Rate:

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IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS

6.3 INITIAL COST ESTIMATE

6.3.1 HVAC Major Equipment Alternate

ITEM	QUANTITY (Units)	CAPACITY	UNIT PRICE		TOTAL PRICE	
			Material	Labor	Material	Labor
1. Chillers		Tons				
2. Boilers		BHP				
3. Pumps		GPM				
		Total Head				
		Motor H.P.				
4. Air Handling Units		CFM				
		MBH Cooling				
		MBH Heating				
		Motor H.P.				
5. Fans Supply		CFM				
		Motor H.P.				
6. Fans Return		CFM				
		Motor H.P.				
7. Fans Exhaust		CFM				
		Motor H.P.				
8. Fans Others		CFM				
		Motor H.P.				
9. Split & Unitary System		Tons				
10. Thru the Wall HVAC units		Tons				
11. Heat Pumps		MBH Cooling				
		MBH Heating				

CHAPTER VI **IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS**

6.3.1 HVAC Major Equipment (continued) Alternate #

ITEM	QUANTITY (Units)	CAPACITY	UNIT PRICE		TOTAL PRICE	
			Material	Labor	Material	Labor
12. Terminal Units e.g. VAV boxes, etc.		CFM				
13. Hot Water Converters & Heat Exchangers		GPM				
		MBH				
14. Cooling Tower		Tons				
15. Fuel Oil Storage Tank w/ Leak Detection System		Gallons				
16. Temperature Control System (Complete)						
17. Misc. Equipment						

GRAND TOTAL:

CHAPTER VI

IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS

6.3 INITIAL COST ESTIMATE

6.3.2 HVAC MATERIALS Alternate

ITEM	QUANTITY (Units)	UNITS OF MEASURE	UNIT PRICE		TOTAL PRICE	
			Material	Labor	Material	Labor
1. Ductwork (Complete including Diffusers, Registers, Grills, Dampers, Insulation, etc.)						
2. Piping HEATING (HWS, HWR)		Feet				
3. Piping CHILLED WATER (CHS, CHR)		Feet				
4. Piping CONDENSOR WATER (CWS, CWR)		Feet				
5. Piping REFRIGERANT (RL, RS)		Feet				
6. Piping CONDENSATE DRAIN		Feet				
7. Steam		Feet				
8. Steam Condensate Return		Feet				
9. Natural Gas		Feet				
10. Fuel Oil (Supply, Return & Vent)		Feet				

GRAND TOTAL:

CHAPTER VI **IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS**

6.3 INITIAL COST ESTIMATE

6.3.3 PLUMBING MAJOR EQUIPMENT Alternate #

ITEM	QUANTITY	UNITS OF MEASURE	UNIT PRICE		TOTAL PRICE	
	(Units)		Material	Labor	Material	Labor
1. Domestic Water Heater & Storage Tank		Storage in Gallons Recovery GPH MBH				
2. Circulating Pumps		GPM Head Motor H.P.				

GRAND TOTAL:

6.3.4 PLUMBING MATERIALS

ITEM	QUANTITY	UNITS OF MEASURE	UNIT PRICE		TOTAL PRICE	
	(Units)		Material	Labor	Material	Labor
1. CW, HW & HWR Piping with insulation		Feet				

GRAND TOTAL:

CHAPTER VI **IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS**

6.4 ANNUAL COST

6.4.1 ENERGY (Excluding Lighting & Receptacles)

<u>Alternate #</u>					
ENERGY SOURCE	UNITS OF MEASURE	ENERGY CONSUMPTION	ENERGY COST	DEMAND CHARGE	TOTAL ENERGY COST
ELECTRIC (Winter)	KWH				
ELECTRIC (Summer)	KWH				
GAS (Winter)	MCF or Therm				
GAS (Summer)	MCF or Therm				
STEAM (Winter)	MLB/HR				
STEAM (Summer)	MLB/HR				
FUEL OIL	Gallons				
COAL	Tons				
OTHERS					
GRAND TOTAL:					

CHAPTER VI IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS

6.4 ANNUAL COST

6.4.2 SERVICE and MAINTENANCE COSTS Alternate

MAJOR EQUIPMENT	SERVICE COST	MAINTENANCE COST	TOTAL SERVICE and MAINTENANCE COST
1. CHILLERS			
2. BOILERS			
3. PUMPS			
4. AIR HANDLING UNITS			
5. FANS (Supply)			
6. FANS (Return)			
7. FANS (Exhaust)			
8. SPLIT AND UNITARY EQUIPMENT			
9. THRU THE WALL UNITS - PACKAGED TERMINAL AIR CONDITIONING UNITS			
10. HEAT PUMPS			
11. TERMINAL UNITS (VAV Boxes, FCU, etc.)			
12. HOT WATER CONVERTORS, FTR, UH's, CUH's etc.			
13. COOLING TOWERS			
14. DOMESTIC WATER HEATERS			
15. TEMPERATURE CONTROL SYSTEM			
16. MISCELLANEOUS EQUIPMENT			
GRAND TOTAL:			

CHAPTER VI

IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS

6.5 SUMMARY

6.5.1 LCCA

PROJECT: _____ USING AGENCY: _____ DATE: _____

LOCATION: _____



COSTS	BASE SYSTEM	ALTERNATIVE #1	ALTERNATIVE #2
INITIAL COST Mechanical Installation			
INCREMENTAL COST Architectural Components (+ or - over Base System)			
INCREMENTAL COST Structural Components (+ or - over Base System)			
INCREMENTAL COST Electrical Components (+ or - over Base System)			
TOTAL INITIAL COST			
ANNUAL COST Energy			
ANNUAL COST Service			
ANNUAL COST Routine Maintenance			
TOTAL ANNUAL COST			
PRESENT VALUE (PV) OF TOTAL ANNUAL COST (Total Annual Cost X PW Factor)			
TOTAL LIFE CYCLE COST (Total Initial Cost + PV)			

RECOMMEND SYSTEM #

CHAPTER VI **IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS**

6.5 SUMMARY

6.5.2 ENERGY CONSUMPTION ANALYSIS FOR ENTIRE FACILITY

ANNUAL ENERGY CONSUMPTION (BTU's)

	SELECTED MECHANICAL SYSTEM <small>(Excluding Lighting & Receptacles)</small>	LIGHTING	RECEPTACLES & MISCELLANEOUS	TOTAL
ELECTRIC POWER				
GAS				
FUEL OIL				
COAL				
OTHERS				

TOTAL BTU's				
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BUILDING AREA <small>(Square Feet)</small>				
ANNUAL KWH/Sq. Ft.				
ANNUAL BTU/Sq. Ft.				

EPI (Total Annual BTU/Sq. Ft. from above =)
--

NOTE: Conversion Factor: 1 KWH = 3413 BTU

Note: KWH/sq. ft. shall apply to electrically operated equipment (e.g. motors, electric heating elements etc.) lighting fixtures, receptacles, and hard connected appliances and equipment.

Note: Energy Performance Index (EPI) for State buildings shall not exceed the minimum values listed in the EPI Table in the Energy Conservation Guidelines for State Buildings.

CHAPTER VI IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS

7. PRESENT WORTH FACTORS for ANNUAL EXPENSES THAT ARE ESCALATING

7.1 PRESENT WORTH FACTORS (20 Year Project Life N=20)

DISCOUNT RATES (D)	ESCALATION RATES (E)				
	.02	.04	.06	.08	.10
.02	20.00	24.78	30.97	38.99	49.42
.03	13.89	16.22	19.02	22.38	26.42
.04	16.41	20.00	24.78	30.97	38.99
.05	11.99	13.91	16.20	18.93	22.21
.06	13.69	16.45	20.00	24.78	30.97
.07	10.45	12.04	13.93	16.17	18.85
.08	11.58	12.75	16.45	20.00	24.78
.09	9.19	10.52	12.09	13.94	16.15
.10	9.93	10.62	12.75	16.45	20.00

NOTE: Present Worth Factor = $\frac{1+E}{D-E} \times \left(1 - \frac{(1+E)^N}{1+D} \right)$

N = Useful Equipment Life in Years (N = 20)

D = Discount (Interest) Rate

E = Escalation Rate

NOTE: When D = E, Present Worth Factor = N

CHAPTER VI IMPLEMENTATION OF LIFE CYCLE COST ANALYSIS

8. GLOSSARY OF ABBREVIATIONS

A/E	Architect/Engineer
D	Discount Rate
E	Escalation Rate or Annual Energy Costs
EPI	Energy Performance Index
FCU	Fan Coil Unit
GSF	Gross Square Feet
I	Initial Cost of Mechanical System including Incremental Cost Impact on other disciplines
M	Annual Maintenance Costs for Life of System
MCF	1,000 Cubic Feet
MLB	1,000 Pounds
MLB/HR	1,000 Pounds per Hour
PR	Present Value
S	Annual Service Cost for Life of System
Therm	100,000 BTU's
TLCC	Total Life Cycle Cost
VAV	Variable Air Volume
VFD	Variable Frequency Drive

CHAPTER VII

TITLE: STANDARDS FOR NEW ROOFING CONSTRUCTION, RE-ROOFING CONSTRUCTION AND ROOFING SYSTEM GUARANTEE REQUIREMENTS	Revised: July 2003
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Responsible Organization: Office of Facilities Planning
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Instructions: This procedure supersedes the DGS Procedure Manual for Professional Services, dated July 1998. Please recycle the superseded document.

1 GENERAL

1.1 FOR NEW BUILDING PROJECTS, the selection of either a steep slope or low slope roofing system shall be based on the results of a 60 year life cycle cost analysis. This analysis shall consider the scope impact on building structural, mechanical and electrical systems required to configure the building for both a steep slope and a low slope roofing system, as well as the maintenance and replacement intervals and costs for both roofing systems.

1.2 FOR ROOF REPLACEMENT PROJECTS, the selection of the replacement roofing system shall be based on an evaluation of costs associated with factors affecting the proposed system, including span dimension, structural condition, foundation design/capacity, and disposition or accommodation of roof top equipment.

1.3 ROOFS ON NEW CONSTRUCTION shall be pitched to drains or gutters, with the roof slope achieved structurally.

1.4 REFERENCES TO NATIONAL STANDARDS DOCUMENTS such as the American Society for Testing Materials (ASTM), American National Standards Institute (ANSI), Factory Mutual System (FM), Underwriters' Laboratories (UL), International Building Code (IBC), American Institute of Steel Construction Manual (AISC), Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), National Roofing Contractors Association (NRCA), National Institute of Standards and Technology (NIST), Asphalt Roofing Manufacturers' Association (ARMA), etc., shall be interpreted to refer to the most current edition or revision in effect at the time a design is in progress as this takes precedence.

1.5 ALL MATERIALS used for roofing systems shall be asbestos free.

CHAPTER VII

STANDARDS FOR NEW ROOFING CONSTRUCTION, REROOFING CONSTRUCTION AND ROOFING SYSTEM GUARANTEE REQUIREMENTS

1.6 A SITE VISIT to verify existing conditions will be made for all roof replacement and roof repair projects to verify existing conditions and dimensions even though as-built drawings are provided. Where composition, thickness or make up of the existing roof system or any of its components cannot be determined by visual means alone, an exploratory investigation shall be conducted to include dismantling or opening up a representative portion of the roof system. Patch and make watertight all areas disturbed during investigation.

2 STEEP SLOPE ROOFS

2.1 STEEP SLOPE ROOFS with a minimum slope of 2-1/2 inches per foot, may be finished with a standing seam metal or sheet metal system or a fiberglass shingle system surfaced with ceramic coated mineral aggregate. All steep slope roofs must have a full width (36") of modified bitumen ice dam protection membrane installed at all eaves and valleys.

2.2 STANDING SEAM METAL ROOFING SYSTEMS shall be fabricated metal panel systems from nominal 22 gauge G-90 galvanized steel conforming to ASTM A446 Grade A and ASTM A525. Alternative panel thickness of 24 gauge or 20 gauge may be considered based on an evaluation of roof framing and purlin spacing. All standing seams shall be double locked with a seam height no greater than 1½ inches.

The system shall conform to the requirements of ANSI Publication A 58.1, BOCA, and the American Institute of Steel Construction Manual. The panels shall have a UL Class 120 rating and the structural uniform uplift load capacity shall be in accordance with ASTM E330. The finish shall be equal to at least 70% Kynar and shall be tested in accordance with ASTM procedures. The system shall have a 20 year manufacturer's weatherproof warranty. The Kynar color finish shall also be covered by a 20 year manufacturer's warranty.

2.3 ASPHALT SHINGLES shall be reinforced with fiberglass wind resistant type, UL Class A, and comply with ASTM D3462 and ICBO ES AC 127. Shingle manufacturer shall provide a 40 (+) year warranty covering repair or replacement of defective shingles as necessary to eliminate leaks. Where "Nailbase" insulation is used ventilation must be provided. Metal drip edges must be installed on all eave and rake edges.

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2.4 SPECIAL ROOFS: Under special conditions relating to aesthetic compatibility with surrounding buildings or historical consideration, the use of clay tiles, slate tiles, or cedar shakes may be deemed appropriate. In these cases specifications and details shall be developed in strict accordance with applicable national standards. The roofing tile or slate manufacturer/quarrier shall provide material defects warranty coverage of 20 years minimum to 50 years or more based on the specific roof material and facility under consideration.

2.5 STEEP SLOPE ROOFS shall be provided with adequate means for interior ventilation through eave or soffit louvers, ridge vents, ventilation boards and thermostatically controlled power fans to prevent moisture condensation and excessive heat under roofing or sheathing.

3 LOW SLOPE ROOFS

3.1 LOW SLOPE ROOFS shall be required to have a minimum slope of 1/4 inch per foot. New buildings shall be designed to achieve the minimum slope of 1/4 inch per foot structurally. Existing buildings may have to be provided with tapered insulation to achieve the minimum slope. Lightweight concrete shall not be used to create slope.

3.2 PRIOR TO PLACEMENT OF INSULATION and the roofing system, all low slope roof decks shall have:

A. Steel Deck: 1" perlite insulation mechanically fastened and 2 plies of fiberglass felts.

B. Concrete Deck: Asphaltic primer and 2 plies of fiberglass felts.

C. Nailable Decks: (other than Wood, Lightweight Concrete, Gypsum, and Tectum) Rosin-sized sheathing paper, 75 lb. ventilated base sheet, mechanical fasteners dictated by deck type, and 2 plies of fiberglass felts.

D. Wood Decks: Mechanically fasten 1" thick perlite insulation to deck and install 2 plies of fiberglass felts with hot asphalt.

- (1) If wood deck is less than 3/4" thick, nail base sheet to deck and install 2 plies of fiberglass felt over base sheet.

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3.3 ON LOW SLOPE ROOFS from 1/4 inch per foot to 2-1/2 inches per foot all felt plies shall be back-nailed on slopes greater than 2 inches per foot and the following roofing system shall be used:

A. Four Ply Built-up System: The system consists of four plies of roofing felts alternately placed, overlapped and saturated with hot asphalt bitumen. Gravel surfacing to be set in hot asphalt. Roofing felts shall be glass fiber and meet the requirements of Tables 1 and 2 ASTM D-2178 Type VI (Asphalt Impregnated). Steep roofing asphalt shall conform to ASTM D-312, Type III.

B. Warranty: The roofing system shall be covered by a 20 year Total System, No Dollar Limit (NDL) Warranty and must include **all** flashings and sheet-metal work. All materials and workmanship are to be fully guaranteed by the roofing manufacturer issuing the warranty. All materials must be manufactured by the manufacturer who is to supply the warranty. Any materials that are not made by the Roofing Materials Manufacturer but submitted for approval must be accompanied by a letter from the Roofing Materials Manufacturer issuing the 20 year NDL warranty, stating that this material is suitable for use with their system and fully covered under their 20 year NDL warranty.

4 INSULATION

4.1 ALL LOW SLOPE ROOFING SYSTEMS shall include insulation. The majority of insulating value shall be accomplished with the necessary thickness of flat poly-isocyanurate boards. Where necessary, roof slope shall be developed with tapered perlite board. Organic insulation material shall not be used under built-up roofs. Light weight concrete insulating fill is not acceptable. In all cases a minimum 1/2" cover board **must** be installed over the Isocyanurate insulation. Perlite and wood fiber are acceptable cover board materials.

4.2 HEAT TRANSMISSION: Insulation heat transmission values shall be established in accordance with the latest revision of the DGS Energy Conservation Guidelines, Chapter V of this Manual. For new buildings the suggested insulation value of the roof area envelope is R-30. For roof replacements/renovations on older buildings, a lower "R" value will be considered.

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4.3 STRUCTURAL: The first ply of insulation systems over metal decks and wood decks shall be mechanically fastened using steel fasteners acceptable to the manufacturer furnishing guarantee of roofing system. Insulation shall also be installed in accordance with Factory Mutual System Class 120 wind uplift guidelines.

4.4 INSULATION shall be applied in several layers, with the joints staggered, in accordance with the manufacturer's recommendation.

4.5 COMPATIBILITY: Insulation material installed between the roof deck and the roof ply shall be compatible with the roof ply material and asphalt bitumen binder or other adhesive used in the roofing system.

4.6 WARRANTY: Insulation materials shall be considered an integral component of the roofing system; and shall be furnished or approved by the roofing system manufacturer; and shall be covered fully by the roofing system warranty.

5 FLASHING

5.1 BASE FLASHING is part of the roofing system and shall meet requirements of manufacturer furnishing roofing system. Where roof meets a parapet or adjacent building wall, the base flashing shall extend up the wall at least 8 inches, but generally not more than 14 inches unless necessary to be consistent with existing conditions or design requirements. If flashing height is greater than 14 inches, than a 2 piece flashing system may be required.

5.2 OTHER FLASHING: Other than base flashing - metal flashing, including expansion joint flashing, shall be in accordance with SMACNA Standards and the NRCA Roofing and Waterproofing Manual and fully covered under the 20 year 'NDL' warranty.

5.3 PITCH POCKETS SHALL BE AVOIDED. Where that is not possible, pitch pockets shall be filled with a pourable urethane sealer. Roof penetrations will be flashed with preformed flexible flashing, using clamps and tents, unless the penetration is such a complex shape that a pitch pocket is required.

5.4 ALL PARAPET WALLS must be covered with a metal coping cap over a "peel and stick" type modified bitumen membrane and any necessary wood blocking/nailers, etc.

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6 ROOF DRAINS

6.1 ROOF DRAINS shall be provided with shallow sumps, gravel stops, and minimum 4.0 pound lead flashing in accordance with the NRCA Roofing and Waterproofing Manual.

6.2 ROOF DRAINS will be located wherever possible at the low points, and crickets must be provided between drains in structurally formed valleys and around any structure impeding the flow of water in the drain field to assure positive water flow to the drains.

6.3 ROOF DRAINAGE PATTERNS should be designed to locate roof drains at the mid-points between columns and beams. Overflow scuppers should be provided through perimeter parapet walls, or overflow relief drains should be provided at roof drain locations, to relieve storm water build-up caused by clogged roof drains.

6.4 ROOF DRAINAGE that is directed to exterior downspouts, splash blocks shall be provided at all ground discharge points. Where possible, downspouts may discharge directly into a storm drainage system.

7 ROOF ACCESS

7.1 PERMANENT ACCESS to all roof areas from the inside of the building shall be provided (with a "ship" type ladder) for all buildings over two stories high with low slope roofs.

7.2 ROOF ACCESS for one and two story buildings with low slope roofs and for buildings with steep slope roofs will be evaluated based on building and roof configuration and roof type.

7.3 EXTERIOR ACCESS must be provided for all multi-level roofs from the second story up.

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8 ROOF MOUNTED EQUIPMENT

8.1 ROOF MOUNTED EQUIPMENT shall be minimized; penthouse enclosures of equipment are preferred.

8.2 ROOF MOUNTED EQUIPMENT shall be installed on curbs and shall be provided with suitable vibration isolation devices.

8.3 IF IT IS NECESSARY TO MOUNT EQUIPMENT ABOVE THE ROOF, without using a curb, sufficient clearance shall be provided under the equipment to permit maintenance of the roofing system, as well as adequate clearance for future roof replacement.

8.3 EQUIPMENT SCREENS must be provided to conceal all roof top equipment.

8.4 INORGANIC WALKING PADS shall be provided from roof access to roof mounted equipment. Modified bitumen membrane is acceptable.

9 CONTRACTOR'S GUARANTEE

9.1 THE CONTRACTOR must have at least 5 years experience installing the type of roofing they are bidding on.

9.2 THE CONTRACTOR must be a NDL certified roofing system installer for at least 5 years continuously (currently), and must provide to the State a current letter from a roofing materials manufacturer stating this and that their workmanship, including flashings and sheet-metal work, will be fully covered by the Manufacturers' 20 year 'NDL' warranty without exception.

9.3 THE CONTRACTOR must also provide the State with a 2 year workmanship guarantee.